# EXPERIENCES IN MOVING ENCOUNTERED BY FAMILIES TRANSFERRED BY THEIR EMPLOYER

by

VIRGINIA BARRETT EVINS

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# CHAPTER I

## INTRODUCTION

The expansion and decentralization of industry has made it necessary for employers to transfer key employees from time to time to a new location. It usually means more pay and prestige to the employee. To the family it means moving and establishing a new home in a new community.

Through personal experience of moving, observations made in different communities, and constant association with families who have been transferred, the writer became aware of the problems families are confronted with when transferred to a new location. Even though each family situation is unique and has its own individual problems there are many characteristics which transferred families have in common with each other. Usually the families are young and have children. They have bought furnishings for four or more rooms. Some financial assistance has been given by the employer usually in the form of a raise in salary for the employee and/or assumed some of the expense involved in relocating the employee and his family. Companies organized on a national or international level tend to assume more of the financial responsibility for a family relocating than the smaller companies. Generally speaking, only two phases of moving are considered - packing and unpacking household furnishings.

It is evident with families who move that there is a great deal more to moving than packing and unpacking. There is a need for information which will help transferred families: (1) locate a suitable

home in a desirable neighborhood with a minimum amount of effort and expense; (2) select household furnishings with good characteristics for moving which require a small amount of floor and storage space and at the same time provide a livable home in different settings; (3) find ways to avoid expenditure for repeated purchases of small items for each new dwelling; and (4) information on how to plan a move to avoid loss of time and energy during the process of moving and getting settled in the new home.

The purposes of this study are: (1) To determine the type of assistance a company gives an employee and his family when being transferred to a new location, (2) To obtain information about how a family locates a house when transferred to a new location, (3) To secure information about how a move is planned and how the plan is carried out, (4) To determine furnishings problems encountered by families getting settled in the new home, and (5) To secure helpful suggestions from families based on their experiences in moving and adapting household furnishings to the new home.

To obtain the information necessary an interview schedule was prepared based on readings on the subject and the personal experience of the writer in moving. A copy of the interview schedule appears in the appendix.

It was decided to interview families who had moved to Greensboro in the last five months. It was believed over this period of time the homemaker could easily recall the experiences encountered by the family in moving.

A list of names of 80 families who had moved to Greensboro between the period of July 1 to November 30, 1957 was obtained from

the Chamber of Commerce. It was assumed the interviewer would be able to find 40 eligible families from the list of 80 names. Of the first 50 families visited, 40 met the requirements of the study. The requirements were: (1) The families had been transferred by their employers, (2) They lived within the city limits of Greensboro, and (3) Had at least one child in the home ten years of age or younger. The writer visited and interviewed the homemaker in the home.

## CHAPTER II

### REVIEW OF LITERATURE

The development of the United States accounts for much upward mobility of families. Employment opportunities are the base of much internal migration. Cavan says, "Fluctuation in employment seems to demand a fluid population with families ready and willing to move at a short notice."[1]

According to Rossi residential mobility has been the subject of many studies which may be classified into three types.[2] Area studies are the most frequently encountered; they used urban, sub-areas, and census information, classified by their mobility rates. Areas with high rates are compared with areas of low rates. A large number of generalizations concerning the close association between mobility rates, and rates of divorce, delinquency, dependency, and housing conditions emerged from studies of this sort. The second type - household studies - have the essential characteristics of the individual household and in some cases the individual person. Mobile households or persons were compared with stable households or persons. Significant differences were found with the respect of neighbors, the incidence of diseases, residences in certain kins of houses, etc. The third type - motivational studies - are concerned with the social-psychological aspect of moving as its distinguishing characteristic. Such

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[1]Ruth Shone Cavan, The American Family, (New York: Thomas Y. Crowell Company, 1953), p. 70.

[2]Peter H. Rossi, Why Families Move (Glencee, Ill., The Free Press, 1955), p. 12.

studies sought to answer why do people move? What reasons do people give for leaving one residence and taking up another one? Attention was usually centered on housing conditions, neighborhood sources, etc. Very few mobility studies have been made of this type.

There has been very little information encountered in published literature concerning housing and furnishing experiences of families who have been transferred by their employer. However, some studies have been concerned with financial and real estate policies of the employer or corporation transferring the employee from one position to another which involves the moving of household furnishings.

## Transfer Policies

The term "transfer" has a much broader meaning than a change in job assignment. Transfer may mean promotion, demotion, or no change in status and responsibility. The term is usually used without any status change. Yoder says:

> There are two principal types of transfers generally noted. 'Personnel transfers' are arranged to meet the needs or preference of the employee. 'Production transfers' are arranged to meet the needs of the production requirement of the employer. People are transferred to meet manpower needs, not necessarily because transferred employees are expected to benefit from it.[3]

In addition to these two types of transfers, Mee mentions: "Transfer to increase employee flexibility as part of a stabilization program."[4]

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[3]Dale, Yoder, Personnel Principles and Policies, (New York: Prentice Hall, Inc., 1953), p. 469.

[4]John F. Mee, Personnel Handbook, (New York: Ronald Press Company, 1951), p. 79.

Whyte[5] points out that many companies are coming to believe that periodic transfer is a positive good in itself, and even where there are no immediate functional reasons existing, it might often be important to move the employee anyway. Some companies, instead of leaving transfers to be determined haphazardly by different departments, have made such decisions part of a systematic managerial program. Whyte declares, "What better way, they ask, 'to produce a well-rounded executive or employee'."

Studies sponsored by Time, Life, Fortune and McGraw-Hill and made by direct mail experts indicate that organization people move the most and the greatest amount of address changing occurs among managerial people. Similarly, records of long distance movers show that the greatest single group among their customers, upward to 40 per cent, consist of corporation employees being transferred from one post to another (with the employer usually footing the bill). If this group is added to the government, army, navy, and men joining new companies, over 70 per cent of all moves are accounted for by members of large organizations.[6]

The big organization is now considered the prime vehicle for a career and in more institutions than corporation. At their present size, the armed forces are a great institutional career in themselves, are in effect a great training ground for indoctrinating each new age group in the organization way, so are government bureaus. Even in professions the emphasis has switched to the organization. Of the professional men

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[5]William H. Whyte, Jr., The Transit, Fortune Magazine, May 1953, p. 114.

[6]Ibid., p. 114.

who graduated in the last decade about one in five is working for himself. The bulk are in group clinics, law factories, Atomic Energy Commission laboratories, corporations, and staff departments. With the growth of foundation grants and huge government grants, academic life has been similarly affected. Academics now find it easier to obtain $200,000 for a group project than a few thousand for someone doing research on his own. Whyte says, "The trend today is that most college men automatically view their future in terms of a salaried life with an organization."[7]

The recruit does not join the big organization because he wants to move a lot and it is often in spite of it, but moving he knows is part of the bargain. Unsettling as transfer might be, it would be even more unsettling if he ~~wasn't~~ were not asked to transfer. As one president put it, " 'We never plan to transfer and we never make a man move. Of course, he kills his career if he doesn't. ' " The fact is well understood; it is with a smile he moves and keeps on moving until that distant day in the future he is recalled to the home office.[8]

The trend is not just more moves per man. Even companies reporting no increase in the number of times moved by each individual report an increase in the number of men being moved. For example:

> General Electric compared a cross section of its 45 year old executives with one of its 35 year old; in the ten years after they were twenty-five, 42 per cent of the older group had moved at least once during the same period, 58 per cent of the younger group had moved.[9]

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[7] Whyte, op. cit., p. 215.

[8] Ibid., p. 113.

[9] Ibid., p. 116.

Corporations never planned it this way, but decentralization and expansion have demanded that personnel be transferred and the related agencies have supported it.

## Characteristics of Transferees

According to Glick[10] the census figures show that the proportion of the families who move within a given year is relatively high among those with young heads and declines as the age of the heads advances. Among families with the heads under 35 years of age, the mobility rate was 35 per cent, twice as high as those between 35-44 (16 per cent), and more than six times (6 per cent) those over 65 years of age.

In the twenty-five to thirty-five year old group the census figures show about 16 per cent of every hundred men who have a high school education have been interstate migrants, versus 29 per cent of those who have had at least a year of college. Forty-six per cent of the men who completed college moved and of those who worked themselves through college outside their home state 70 per cent moved.[11]

> The more education, the more mobility. If a man goes to college now, the chances are almost even he won't return to work in his home state. The educational level is higher among migrants than non-migrants. The higher the education level the more intense the migration.[12]

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[10]Paul G. Glick, American Families, prepared for the Social Science Research Council in cooperation with the U.S. Department of Commerce and Bureau of the Census. (New York: John Wiley & Sons, Inc., 1957), p. 89.

[11]Ibid., p. 90.

[12]Ernest Hawrmann and Patricia West, They Went to College, based on a survey made by Time magazine, analyzed by Columbia University Bureau of Applied Social Research, (New York: Harcourt Brace and Company, 1952), p. 276

## Financial Assistance by Company

Companies take different views in the assistance offered a transferred employee in moving to a new community. The American Management Association took a sample of 24 companies and asked the amount of financial help a company should extend to its employee when transferring as an individual employee. The results were as follows:[13]

66 per cent pay transportation cost of one person while house hunting.

58 per cent pay transportation cost of wife and husband while house hunting.

37 per cent allowed a per diem allowance while house hunting.

91 per cent of the companies put the employee on an expense account in a new town until the family arrived.

77 per cent paid his fare home for visits before moving.

37 per cent make up losses of an unexpired lease.

25 per cent reimbursed the employee for loss in selling his house.

20 per cent granted direct loan for purchases of a home.

8 per cent paid rent on the new dwelling.

Then the American Management Association made a second sample of nine companies which relocated themselves. Financial assistance was more bountiful: All transportation and living expenses in transit were paid by the companies. Eight of the companies paid for unexpired leases. In both the individual transfer and the companies relocating all paid for the shipment of employees household furnishings.[14]

In many instances the transfer of an employee will mean that a real estate transaction must take place. A house will have to be sold

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[13] How Companies Help Transferred Employees, Business Week, No. 1307, September 1954, p. 48.

[14] Ibid., p. 48

and/or bought. Many companies have established policies concerning this. General Motors Company and Ford Motor Company provide: "That in the case of the salaried employee the company will offer to buy his house at an appraisal value on the fair market."[15]

Generally speaking, companies do not like to get involved in the transaction of real estate of their employees. This view is expressed by an executive of a large oil company.

> "Under no circumstances will the company involve itself in the sale or purchase of a house, or advance money for the down payment of a new house until the employee gets his equity out of the sale of the old one."[16]

The Company may defray the financial aspect of purchasing or selling the old home and assisting the purchase of a new home but there is the problem of the employee locating the house in the new community for the family. Most companies have certain practices and procedures which they will follow and will adopt one of the following according to Mee:

1. Assistance in locating living quarters for the employee through the medium of newspaper advertisement. Usually handled by the personnel department.
2. Appointment of real estate specialist on the company staff to help the employee locate living quarters.
3. Cooperation with real estate companies.
4. Financial assistance to the employee building their own homes.
5. Construction of homes or apartments to be rented to the employee.
6. Construction of homes to be sold to the employee.
7. Encouragement of employees to buy homes with some protection against possible less in case of quick sale.[17]

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[15]The Real Estate Side of Executive Changes, Business Week, No. 1314, April 1955, p. 122.

[16]Ibid., p. 123.

[17]Mee, op. cit., p. 587.

## Suggestion for Moving

A move which is well planned will minimize its uncertainities and hazards. Not only will systematic organization smooth out the problems but also cut down on the expense of delays, breakage and confusion on moving day, and enable the family to resume its normal routine quicker. In order to plan a move satisfactory the following suggestions are made to the families concerning locating a home in a new community; selecting a transfer company; packing and unpacking household furnishings; and selecting household furnishings for moving.

### Locating the New Home

The transferred family may prefer or be forced to search for a home on their own. Many popular magazines have printed helpful suggestions for families searching for a home in a new community and the points emphasized are: buy a city map with a street directory, study desirable neighborhoods and districts, drive around selected areas and locate "For Rent" signs, use classified section of telephone book for realtors, or "Real Estate Rentals", advertise in the classified section of the newspaper. Other sources of locating rental property are clergyman, utility companies, milk drivers and paper boys. Warmington says:

> If all else fails, emergency housing can often be secured through the local Housing Registery, Travelers Aid Society or Family Service. These community agencies usually have temporary housing facilities available for the stranded family.[18]

### Selecting the Transfer Company

Many industrial companies prefer to let the employee select and

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[18]Carl Warmington, Moving Made Easier (Akron, Ohio: Jay-Todd Publications, 1957), p. 13.

make the arrangements with the transfer company, especially an individual transfer. The employee should choose a reliable transfer company very carefully and plan the move to avoid pitfalls of delay and damaged furniture. Some of the general suggestions are helpful:

Obtain several moving estimates - free service offered by all transfer companies.

Remember estimates may be higher or lower than the ultimate charges.

Cut-rate operators may quote a low estimate to secure an order and estimates are not binding.

Reserve a van in advance.

Avoid peak moving periods (1st and 15th of the month).

Select a transfer company which will carry the furniture direct to the new home to avoid unloading and reloading enroute.

Prepare inventory, tags and label boxes.[19]

It takes about six hours to load or unload a six room house.

Check "en route" household insurance coverage.

If it is an out of state move, the rules of the interstate Commerce Commission require that the moving company collect transportation charges at the time of deliver or within seven days thereafter.

In actual practice, all movers require payment before unloading the household furnishings.

Have a certified check or cash ready to pay the driver.[19]

## Packing and Unpacking Household Furnishings

The decision as to whether the family should pack and unpack the household furnishings for a move is usually a personal preference for the family. The family which does their own packing should remember that

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[19]Ibid., p. 14.

the transfer company is responsible for only damage to furnishings packed by their packers. The president of a large transfer company says,

> Many people ask for trouble, simply because they won't let the movers do their job. The handling and transportation of household goods has become a highly specialized skill during recent years and is one which is best left to trained and experienced experts.[20]

In addition to this Shea explains,

> The transfer company employs experienced packers, and they prefer to do all of the packing themselves. Even to taking down the pictures and curtains. It facilitates matters if all bric-a-brac is assembled on a table, all glassware placed in another space, and the best china segregated.[21]

Whether the family does the actual packing or permits experts to do it for them, there are several practical tips which are helpful for preparing and packing for a move:

Don't overload or put breakables in drawers.

Don't move inflammable, explosives, acids, paints, shotgun shells, matches, and chemistry sets.

Fasten tops of liquids with scotch tape.

China, glassware - wrap in light paper, pack in excelsier or shredded paper. Stand dishes on end. Barrels and drums are the best containers.

Lamp shades - wrap in tissue paper and place in cartons.

Pictures - valuable pictures, glass, marble tops should be padded, wrapped and crated.

Mirrors - will be removed from dressers and replaced by movers.

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[20]James D. Edgett, "Millions on the Move", American Magazine August 1952, Vol. 154, No. 2.

[21]Nancy Shea, The Air Force Wife, (New York: Harper & Brothers Publishers, 1956), p. 241.

Rugs - movers prefer that you roll rugs unless they have been cleaned and wrapped.

Linens, curtains, blankets, and wearing apparel are the best placed in strong cases or trunks.

Bedding - place bedding in box or wrap with a sheet. Do not roll mattress. Movers usually provide special slip covers.

Pots and pans - put kitchen utensils in barrels.

Brooms, mops, curtain rods, etc., should be tied together.

Small articles - place in boxes or barrels.

Books - pack books, back to back in small strong securely tied boxes. Thirty books are about one man's load. Remember there is an economy in mailing books by parcel post (8¢ for the first pound and 4¢ per each additional pound up to 70 pounds).

Take loose shelves out of book cases. Tie hardware and shelves together.

Valuables - remove all valuables such as jewelry, logal documents, money, insurance policies, etc. The mover is not responsible.

Radio, phonograph, T.V. - tie movable parts such as tone arm and pack records.

Phonograph records - pack in small cartons. Use corrugated paper inserts to separate records. Mark "breakable".

Medicine - scotch tape, pack each bottle separately and mark box "liquid and breakable".

Plants - tie branches of large bushy plants to a stake in pot. Regulations prevent transit of plants to many states even in a car.

Frozen foods - cannot be accepted if the shipment is for more than 150 miles or delivery will not be completed in 24 hours from time of loading furnishings.[22]

The suggestion is often made for the homemaker to draw a floor plan and the furnishings to scale for the new home and have the movers place the furniture exactly where it will be used to avoid rearranging. This

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[22] Warmington, op. cit., p. 15.

suggestion has merit under certain conditions if the home has been cleaned thoroughly before moving and they are not planning to redecorate immediately. If the homemaker has visited the new home before moving and visualized her furnishings in the rooms and is familiar with the lighting (natural and artificial) and color scheme of the new home; she could probably work out an effective plan on a scale drawing which would save her time and energy later providing she has plenty of time before the move.

## Selecting Household Furnishings

In so far as this writer can determine very little information has been written concerning selecting furniture which has good qualities, and features for moving easily and adapting to a new home. Written information applicable to selecting furnishings with good qualities and features for moving concerns: (1) flexible, dual purpose, furnishings which stack or fold to be stored (stools, chairs and tables), (2) finishes and colors which do not show scratches and scars easily, (3) small scale furnishings, and (4) color of furnishings, neutral and accenting with bright accessories.

## CHAPTER III

## THE FAMILIES

All of the families made the move as an individual transfer at the request of the employer except one family who had requested a transfer to a southern location because of the health of one of their children. This family had chosen Greensboro at random from a map. In this chapter the families are described in terms of: (1) month the families moved, (2) number of times transferred, (3) number in household, (4) ages of children, (5) information about Greensboro before moving, and (6) financial assistance by employer.

### Month Families Moved

The period of time the families had lived in Greensboro ranged from one week to five months. It was evident from the homemakers' conversation that all of the families had not moved immediately after the husband was transferred. The reason usually was either to avoid interrupting a child or childrens' school year or suitable housing was not available immediately. The months the families moved were as follows:

| | Number of families |
|---|---|
| July | 10 |
| August | 9 |
| September | 9 |
| October | 6 |
| November | 6 |

### Number of Times Transferred

For most of the families, it was the first or second time to be transferred and move household furnishings by their present employer (Table 1).

However seven families had been transferred three or more times, and one family eight times.

TABLE I

NUMBER OF TIMES FAMILY HAS BEEN TRANSFERRED BY EMPLOYER

| Number of times transferred | Number of families |
|---|---|
| One | 16 |
| Two | 15 |
| Three | 3 |
| Four | 5 |
| Eight | 1 |
| | 40 |

## Number in Household

The members of each household consisted of mother, father and one or more children with the exception of one in which the homemaker's mother lived in the home. The number of family members was as follows:

| | Number of families |
|---|---|
| Three | 10 |
| Four | 18 |
| Five | 7 |
| Six or seven | 5 |

## Ages of Children

The children have been classified into the following age levels:

Infant - less than one year of age

Preschool - one to six years of age but not in school

Grade school - six to twelve years

Adolescent - thirteen to sixteen years.

One-fourth of the families had only one child usually an infant or preschool child (Table II). Three-fourths of the families had two or more children: most of the youngest children were of preschool age; most of the oldest children were of grade school age.

TABLE II

AGE LEVEL OF CHILDREN

| Age of Children | Only | Youngest | Oldest |
|---|---|---|---|
| | (Number of families) | | |
| Infant | 3 | 6 | 0 |
| Preschool | 5 | 16 | 6 |
| Grade school | 2 | 8 | 21 |
| Adolescent | 0 | 0 | 3 |
| | 10 | 30 | 30 |

## Information About Greensboro

About one-half of the families had some information about Greensboro before moving (Table III). Ten families had previously lived in Greensboro or vicinity. Three of the homemakers, including one whose home was in Greensboro, had attended college in Greensboro. Six families had received information about the city from either friends, husband, brother and employer's booklet or encyclopedia.

## Financial Assistance by the Employer

In the 40 families interviewed, most of the husbands were employed by different companies. In all, thirty-one companies were represented (Table IV). The company employing the largest number of husbands was Burlington Industries, whose home office is located in Greensboro.

TABLE III

SOURCE AND KIND OF INFORMATION ABOUT GREENSBORO BEFORE MOVING
(19 families who had information about Greensboro before moving)

| Source of information | Number of families | Information about Woman's College | Experience of attending college in Greensboro | Experience of living in Greensboro and/or vicinity | Information about Greensboro [1] |
|---|---|---|---|---|---|
| Friends | 4 | 1 | | | 3 |
| Wife | 3 | | 3 | 1 | |
| Husband | 3 | | | 2 | 1 |
| Wife and husband | 3 | | | 3 | |
| Wife and husband experience of living in Greensboro | 4 | | | 4 | |
| Brother and employer's booklet | 1 | | | | 1 |
| Encyclopedia | 1 | | | | 1 |
| | 19 | 1 | 3 | 10 | 6 |

1. Information about the size of the city, schools, population, doctors and climate.

TABLE IV

EMPLOYER OF TRANSFEREE

| Employer | Number of families |
|---|---|
| Burlington Industries | 6 |
| Gladolia Biscuit Company | 3 |
| International Business Machine Company | 2 |
| Sears Roebuck Mail Order | 2 |
| Associated Transport Company | 1 |
| Bison Freight | 1 |
| Blue Bell | 1 |
| Bostage-Atlantic Corporation | 1 |
| Coca Cola Company | 1 |
| Curtiss Candy Company | 1 |
| Eastern Management Company | 1 |
| Esso Standard Oil | 1 |
| Federal Home Owned Bank Board | 1 |
| Florist Telegraph Delivery Association | 1 |
| General Electric Credit | 1 |
| Handleman Drug Wholesale | 1 |
| Hartford Accident Indemity Company | 1 |
| Howard Construction Company | 1 |
| Jewel Tea Company | 1 |
| J. P. Stevens Company | 1 |
| New Dixie Transportation | 1 |
| Panther-Oral-Grace Manufacturing Company | 1 |
| P. Lolliard Company | 1 |
| Sears Roebuck Retail Store | 1 |
| Sherwin Williams Paint Company | 1 |
| Southern Railway | 1 |
| Special Services Railway Corp. | 1 |
| Trane Company | 1 |
| Trans-Contential Gas Pipe Line | 1 |
| Unioh Life Insurance | 1 |
| United States Marine Corp. | 1 |

The employer paid for the shipment of household furnishings for all except six of the families (Table V). Three of the six families received part payment and three received none. Other employer practices common to 40 to 50 per cent of the families were: paying the husband an expense account before the family moved; paying the expenses of the family or a family member while house hunting; and paying the husband's expenses for visits home before the family moved. However, only three families reported a reimbursement of financial loss in real estate but several families indicated the willingness of their employer to make up such a loss if one had occurred.

TABLE V

FINANCIAL ASSISTANCE BY THE EMPLOYER TO THE TRANSFEREE AND FAMILY

| Financial assistance | Number of families | | |
|---|---|---|---|
| | All | Part | None |
| Shipment of household furnishings | 34 | 3 | 3 |
| Expense account for husband before family moved | 23 | 1 | 16 |
| Expense account for family members while house hunting | 22 | 1 | 17 |
| Husband's expenses for visits home before family moved[1] | 15[a] | 0 | 24 |
| Moving allowance for incidental expenses | 3 | 0 | 37 |
| Storage of furniture | 3 | 0 | 37 |
| Reimbursement of financial loss | | | |
| Unexpired lease | 2 | 0 | 38 |
| Brokerage and lawyer's fee | 1 | 0 | 39 |
| Loss in selling the house | 0 | 0 | 0 |
| Payment for installation | | | |
| Draperies | 2 | 0 | 38 |
| Dryer | 2 | 0 | 38 |
| Telephone | 2 | 0 | 38 |
| Air conditioner | 1 | 0 | 39 |
| Television antenna | 1 | 0 | 39 |
| Payment of rent for the new home | 1[b] | 0 | 39 |
| Interior painting | 1 | 0 | 39 |
| Maid service while moving | 1 | 0 | 39 |
| North Carolina license plate for car | 1 | 0 | 39 |

1. Wife did not know if employer paid for husband's visits home before family moved.

a. One of these families reported that employer paid for visits home once a month.

b. This family reported that employer paid rent for a period of two weeks.

## CHAPTER IV

## DWELLINGS

In order to determine how a transferred family meets its housing needs when transferred to a new location, information was needed concerning how the families located the dwelling unit, the type of dwelling, method of assistance used, reasons for selecting, and the condition of the unit when the family moved in household furnishings.

### Locating the New Home

All of the families assumed the responsibility of finding the new home. Most of the homes were located by an advance trip to Greensboro, paid for either by the employer or the family (Table VI). Several of the families mentioned using their vacation time to locate a dwelling, especially those who purchased a house prior to moving. One-half of the homes were located by the wife and husband or by the whole family. Forty per cent were located by the husband.

TABLE VI

METHOD OF LOCATING NEW HOME

| Method | Number of families |
|---|---|
| Advance trip to Greensboro | |
| Husband | 16 |
| Wife and husband | 10 |
| Family | 9 |
| Wife | 1 |
| Located by friends | 2 |
| Searched after the arrival of family and household goods | 2 |
| | 40 |

### Reason for Selection

Eleven of the 40 families gave one reason, the others gave more than one reason for selecting the new home (Table VII). However, the eleven families who gave one reason stated that it was the only one available. Most of these families lived in apartments and many considered it temporary quarters until suitable housing could be located. About 40 per cent of the reasons for selecting the particular dwelling pertained to location; either the family like the location in the city or it was in a particular place which would be convenient for the family or a family member. Twenty-two per cent of the reasons given were that the house fitted the family and/or furnishings.

### Method of Assistance Used

Three-fourths of the families used the assistance of real estate agents or real estate listings in the newspaper in locating the new home (Table VIII). Other sources of assistance used by a few of the families were friends, associates at work, company, and contractor.

### Type of Dwelling Unit

Twenty-five of the families lived in houses; 14 of them had bought the house. Fifteen families lived in apartments. Those who lived in apartments either considered them temporary living quarters of the families had kept their furniture at a minimum so it would fit into an apartment.

The type of dwelling was related to the age level of the children. Of the families with the oldest child an infant or preschool child, half lived in an apartment (Table IX). Most of the families with the oldest child of grade school age or adolescence lived in a house.

TABLE VII

REASONS FOR SELECTION OF NEW HOME

| Reasons | Number of families[1] | |
|---|---|---|
| Location | | 44 |
| Liked location in the city | 15 | |
| Near school | 11 | |
| Near shopping center | 6 | |
| Near husband's work | 3 | |
| Near church | 3 | |
| Near proposed junior high school | 2 | |
| Near busline | 1 | |
| Near college | 1 | |
| Near park and swimming pool | 1 | |
| Near proposed park and play ground | 1 | |
| Fitted family and furnishings | | 23 |
| Large enough for family | 13 | |
| Furnishings fit the house | 5 | |
| Appliances furnished | 2 | |
| Color scheme | 2 | |
| Floor plan similar to previous home | 1 | |
| Only one available immediately | 17 | 17 |
| Features of the house | | 10 |
| Liked the floor plan | 3 | |
| Could select floor plan from contractor | 3 | |
| Brick | 1 | |
| New house | 1 | |
| Storage space | 1 | |
| Two story | 1 | |
| Financially possible | | 7 |
| Within price range | 6 | |
| G. I. Loan available | 1 | |
| House surroundings | | 4 |
| Outside play area for children | 2 | |
| Fenced in back yard | 1 | |
| Trees | 1 | |
| Quality | | 2 |
| Nicest one available | 1 | |
| Zoned | 1 | |

1. The number of reasons stated by families were as follows: one reason (11 families); two reasons (9 families); three reasons (11 families); four reasons (5 families); five reasons (3 families); nine reasons (1 family).

TABLE VIII

SOURCE OF ASSISTANCE USED IN LOCATING THE NEW HOME
(38 families who reported using assistance)

| Source of assistance | Number of families | |
|---|---|---|
| One source | | 25 |
| Real estate agent | 10 | |
| Real estate listing in newspaper | 7 | |
| Associate at work | 4 | |
| Friends | 3 | |
| Contractor | 1 | |
| Two sources | | 13 |
| Real estate agent and listings in newspaper | 4 | |
| Real estate agent and associate at work | 2 | |
| Real estate agent and friends | 2 | |
| Real estate agent and company assistance | 2 | |
| Real estate listings in newspaper and contractor | 1 | |
| Real estate listings in newspaper and friends | 1 | |
| Friends and associate at work | 1 | |
| | | 38[a] |

a. Two families reported finding new home through search on their own without assistance.

TABLE IX

TYPE OF DWELLING ACCORDING TO THE AGE LEVEL OF THE ONLY OR OLDEST CHILD IN THE FAMILY

| Age level of only or oldest child | Number of families | Dwelling unit | |
|---|---|---|---|
| | | Apartment Rented | House Bought |
| Infant | 4 | 2 0 | 2 |
| Preschool | 10 | 5 3 | 2 |
| Grade school | 23 | 8 7 | 8 |
| Adolescent | 3 | 0 1 | 2 |

## Condition of the House

Most of the dwellings were cleaned before the families moved in with their household furnishings (Table X). The person responsible for

cleaning was the contractor, landlord, or former owner in about half of the dwellings, and the family members in almost half. Many homemakers expressed dissatisfaction with the cleaning by the landlord. Perhaps the cleaning the landlord was responsible for did not meet the standards of the homemaker.

In addition, 60 per cent of the families reported that the interior had been freshly painted either completely or partially. The person responsible for painting was usually the landlord or contractor.

TABLE X

PERSONS WHO CLEANED AND/OR PAINTED THE NEW HOME

| Process | Person responsible | Number of families |
|---|---|---|
| Cleaned | Homemaker | 11 |
| | Contractor | 8 |
| | Landlord | 8 |
| | Landlord and family | 5[a] |
| | Husband | 3 |
| | Former owner | 2 |
| No cleaning reported | | 3 |
| | | 40 |
| Interior freshly painted | Contractor | 9 |
| | Landlord | 4 |
| | Former owner | 2 |
| Partially painted | Landlord | 9 |
| No painting reported | | 16 |
| | | 40 |

a. Landlord waxed floors and family completed the cleaning.

# CHAPTER V

## THE MOVING PROCESS

The families had at least four rooms of furnishing to be moved and there was a wide range in distance they moved. The families had moved to Greensboro from Maine, California, Texas, Winston-Salem, and various other points. All of the families had assumed the responsibility of making the arrangement with the transfer company for moving the household furnishings and selected the transfer company of their choice except the employees of two companies. The families with these companies mentioned that a transfer company was under contract with their employer to do all of the moving of household furnishings for the personnel.

### Packing and Unpacking and Arrival

Household furnishing were packed by the movers alone for three-fourths of the families, however, less than one-half of the families used the movers alone for unpacking (Table XI). In all of the other families, with the exception of two, the wife either packed or unpacked alone with the help of husband and/or movers.

Perhaps the reason why more movers packed than unpacked was that the moving company was responsible for only what they packed and the family felt that the loss in breakage would not be as great if experienced movers packed. Some of the homemakers indicated that they preferred to do their unpacking so they could arrange and place the furnishings and be able to find them more easily later.

TABLE XI

PERSONS WHO PACKED AND UNPACKED HOUSEHOLD FURNISHINGS

| Persons who packed and unpacked | Number of families |
|---|---|
| **Packed** | |
| Movers | 30 |
| Wife | 4 |
| Wife and husband | 4 |
| Wife and movers | 2 |
| | 40 |
| **Unpacked** | |
| Movers | 18 |
| Wife | 7 |
| Wife and husband | 5 |
| Wife and movers | 3 |
| Movers and husband | 2 |
| Wife, husband and movers | 5 |
| | 40 |

Most of the household furnishings arrived on schedule (Table XII). Only seven families reported a delay which made it necessary to make temporary living arrangements.

TABLE XII

ARRIVAL OF HOUSEHOLD FURNITURE AND ADJUSTMENT MADE BY FAMILIES WHOSE FURNISHINGS WERE DELAYED

| Arrival of household furnishings | Family adjustment during delay | Number of families |
|---|---|---|
| On schedule | | 32 |
| Few hours delay | | 1 |
| Delayed | Lived in motel | 5 |
| | Motel and parents home | 1 |
| | Lived in the apartment | 1 |

## Suggestions for Other Families Planning a Move

A diversity of opinion was shown in the suggestion for other families planning a move. Many of the suggestions showed ingenuity in preplanning and moving.

| | |
|---|---|
| **Advance preparation** | |
| Throw away all junk | 2 |
| Sort all furnishings by rooms | 2 |
| Clean out closets before getting ready to pack | 2 |
| Do not throw anything away you may need it | 2 |
| Save newspaper in advance | 1 |
| **When to pack** | |
| Start packing two weeks before moving | 3 |
| Pack at night when children are asleep | 1 |
| Pack out of season items first | 1 |
| **How to pack** | |
| Label boxes for contents and the room they will go in the new home | 5 |
| Pack each room of furnishings together | 3 |
| Pack kitchen utensils which will be needed immediately after arrival in one barrel | 1 |
| Pack pictures in boxes | 1 |
| Pack books in small boxes | 1 |
| Do not pack light and heavy things in the same container | 1 |
| Do not pack in drawers | 1 |
| When moving more than 1000 miles sell furniture and buy new | 1 |
| **Who to pack and unpack** | |
| Let movers do the packing | 6 |
| Have expensive china and glassware packed by movers | 1 |
| Let movers pack and unpack | 4 |
| Do your own packing | 4 |
| Supervise movers packing and unpacking | 1 |
| Stay on premises when movers are loading | 1 |
| Not necessary to be present when movers are packing | 1 |
| Go to a hotel when movers come to pack | 1 |
| Plan to be present when movers unload | 3 |
| Have boxes carried into the room which they will be unpacked in | 4 |
| Unpack one room at a time | 1 |

| | |
|---|---|
| Transfer company | |
| Select a reliable transfer company | 6 |
| Use the same company for each move | 1 |
| Have a definite understanding with the company as to the number of men and time furnishings will be unloaded | 1 |
| Plan with transfer company to have furnishings delivered to the new address without having to be unloaded and reloaded enroute | 1 |

# CHAPTER VI

## ADAPTING THE FURNISHINGS TO THE NEW DWELLING

In this chapter the furnishings which did not adapt easily to the new dwelling are described in terms of problems and solutions by rooms. The adaptations of particular pieces of furniture to the new dwelling and suggestions made for other families buying furniture.

### Problems and Solutions by Rooms

Most of the families had furnishings which did not adapt easily to one or more rooms of the new home. Fifteen families reported 20 problems requiring adaptation of furnishings to the children's bedroom (Table XIII). All of the problems except one were concerned with insufficient space for toys or good arrangement of certain items of furniture according to the homemaker's standards.

In contrast, fewer families had problems in adapting furnishings to the master bedroom than any other room. Eight families had 10 problems of adapting furnishings to this room (Table XIV). The two problems mentioned by the homemakers were insufficient space for good arrangement and the color scheme was not suitable for the furnishings.

The chief problem in the living room, work and dining areas was either the existing space was too small or the pieces of furniture or equipment was too large in size or scale (Tables XV, XVI, and XVII).

The solutions used by 60-70 per cent of the families who had problems in adapting furnishings in the children's bedroom, master bedroom and dining area was to use the best arrangement possible with

TABLE XIII

FURNISHINGS WHICH DID NOT ADAPT EASILY TO THE CHILDREN'S BEDROOM
(15 families who reported having furnishings which did not adapt easily)

| Problem | Number of families | Solution |
|---|---|---|
| Too many toys for space | 11 | Using though crowded (6)<br>Stored in extra bedroom<br>Stored in basement of the apartment (2)<br>Stored under oil tank outside<br>Left part of the toys behind |
| Not enough space for:<br>Good arrangement of furniture | 4 | Best arrangement possible using available space |
| Child's wardrobe | 1 | Stored in basement of apartment |
| Not enough bedrooms for good arrangement | 3 | Using furnishings for two bedrooms in one |
| Color scheme not suitable for draperies and bedspread | 1 | Bought new ones |

TABLE XIV

FURNISHINGS WHICH DID NOT ADAPT EASILY TO THE MASTER BEDROOM
(8 families who reported having furnishings which did not adapt easily)

| Problem | Number of families | Solution |
|---|---|---|
| Not enough space for:<br>Good arrangement of furniture | 5 | Best arrangement possible using available space |
| Vanity dresser | 1 | Commercial storage |
| Cedar chest does not fit the color scheme or balance the arrangement | 1 | Using it anyway |
| Color scheme not suitable for draperies | 3 | Not using any<br>Bought new ones (2) |

TABLE XV

FURNISHINGS WHICH DID NOT ADAPT EASILY TO THE LIVING ROOM
(13 families who reported having furnishings which did not adapt easily)

| Problem of adapting | Number of families | Solution |
|---|---|---|
| Furnishings too large: | | |
| Television | 4 | Best arrangement possible using available space (2)<br>Traded in for a smaller model (2) |
| China cabinet | 1 | Best arrangement possible using available space |
| Chair | 1 | Exchanged it with mother |
| Mirror | 1 | Not hung, stored in basement |
| Console radio and record player | 1 | Gave it away |
| End table for sectional sofa (living room) | 1 | Using it in the den |
| Sofa (den) | 1 | Best arrangement possible using available space |
| Bookcase | 1 | Using in children's room |
| Curtains did not fit the windows | 1 | Altered and used |
| Draperies, color not suitable for color scheme | 1 | Bought new ones |
| Furnishings were not suitable for the new home | 1 | Sold all furnishings before moving and plans to redecorate |

TABLE XVI

FURNISHINGS AND EQUIPMENT WHICH DID NOT ADAPT EASILY TO THE WORK AREA
(12 families who reported furnishings and equipment which did not adapt easily)

| Problem[1] | Number of families | Solution |
|---|---|---|
| Not enough space: | | |
| Freezer | 2 | Placed on the back porch (2) |
| Refrigerator | 2 | Using in front of window<br>Using in dining area of living room |
| Drop leaf table | 1 | Using in the bedroom |
| Dryer | 1 | Using on back porch |
| Dryer and washing machine | 1 | Installed in basement of the apartment |
| Stove and refrigerator | 1 | Stored in basement of the apartment |
| Dishes | 2 | Stored in basement of the apartment<br>Stored with family |
| Table and chairs | 1 | Stored with family |
| Washing machine | 1 | Sold and bought a smaller model |
| Gas stove; house wired for electricity | 1 | Sold and bought an electric model |
| Stove and refrigerator did not match color scheme | 1 | Sold and bought new |
| Dish drainer too large for sink | 1 | Using it anyway |
| Left hand refrigerator in space designed for a right hand | 1 | Using it anyway |

1. There was not a question on the schedule about electrical wiring but three families reported insufficient number of outlets.

TABLE XVII

FURNISHINGS WHICH DID NOT ADAPT EASILY TO THE DINING AREA
(10 families who reported having furnishings which did not adapt easily)

| Problem of adapting | Number of families | Solution |
|---|---|---|
| Not enough space for furnishings in the dining area | 9 | Used though crowded (5)<br>Dining room furnishings used in living room<br>Dining table exchanged with mother for smaller table<br>Dining room furnishings in spare bedroom<br>Dining room furnishings in commercial storage |
| Dinette furniture not suitable for eating area in the living room | 1 | Using it anyway |

the available space (Table XVIII). However, in the work area more families mentioned using the kitchen and laundry equipment in another room or location. In the living room a variety of solutions were used but the two most frequently mentioned were to use or exchange item of furniture for a smaller model.

TABLE XVIII

SOLUTIONS USED TO SOLVE PROBLEMS
(27 families who reported solutions to their problems)

| Solutions | Room | | | | | Total |
|---|---|---|---|---|---|---|
| | Children's bedroom | Master bedroom | Dining area | Work area | Living room | |
| Made best arrangement possible | 13 | 6 | 6 | 4 | 4 | 33 |
| Used in another room or location | 0 | 0 | 1 | 6 | 2 | 9 |
| Altered and used | 0 | 0 | 0 | 0 | 1 | 1 |
| Stored in another room or basement | 4 | 0 | 1 | 2 | 1 | 8 |
| In commercial storage or with family | 0 | 1 | 1 | 2 | 0 | 4 |
| Stored under oil tank (toys) | 1 | 0 | 0 | 0 | 0 | 1 |
| Sold and/or bought new | 1 | 2 | 0 | 3 | 2 | 8 |
| Traded for a smaller item | 0 | 0 | 0 | 1 | 3 | 4 |
| Gave away | 0 | 0 | 0 | 0 | 0 | 1 |
| Not used | 0 | 1 | 0 | 0 | 0 | 1 |

Families living in apartment compared with those living in houses, had more problems in adapting furnishings to the dining area and the children's bedroom, but fewer in the bedroom (Table XIX). The problems of adapting furnishings in the living room were of equal proportion for families living in apartments or houses.

TABLE XIX

TYPE OF DWELLING AND ROOM WHICH FURNISHINGS DID NOT ADAPT EASILY
(27 families who reported having furnishings which did not adapt easily)

| Room | Number of families | Type of Dwelling | |
|---|---|---|---|
| | | Apartment (15 families) | House (25 families) |
| Children's bedroom | 15 | 8 | 7 |
| Dining area | 10 | 6 | 4 |
| Living room | 13 | 5 | 8 |
| Work area | 12 | 3 | 9 |
| Master bedroom | 9 | 2 | 7 |

1. Number of rooms which presented problems stated by the families as follows: one room (11 families); two rooms (7 families); three rooms (4 families); four rooms (3 families); five rooms (2 families).

## Adaptations of Furnishings

Adaptations of furnishings to make the new home more livable include: (1) furnishings stored, (2) furnishings cleaned, upholstered, and refinished, (3) makeshifts used, (4) permanent improvements constructed, and (5) furnishings bought.

### Furnishings Stored

Some household furnishings were reported in storage by approximately one-fourth of the families (Table XX). Furnishings were stored with family or friends by eight families; in commercial storage by three families. The furnishings most frequently stored were: the furnishings of a whole room - dining room, bedroom, living room - and outdoor furniture and garden tools.

TABLE XX

HOUSEHOLD FURNISHINGS STORED WITH FAMILY OR FRIENDS OR IN COMMERCIAL STORAGE
(11 families who stored furnishings)

| Place | Furnishings stored | Number of items | Number of families |
|---|---|---|---|
| Family or friends home | | | 8 |
| | Dining room furnishings | 5 | |
| | Outdoor furniture and garden tools | 4 | |
| | Living room furnishings | 2 | |
| | Bedroom suite | 2 | |
| | Bed | 2 | |
| | Room divider | 1 | |
| | Refrigerator | 1 | |
| | Gas stove | 1 | |
| | China, crystal and silver | 1 | |
| | Small kitchen equipment | 1 | |
| | Toys | 1 | |
| Commercial storage | | | 3 |
| | Bedroom suite | 2 | |
| | Dining room suite | 1 | |
| | Living room furnishings | 1 | |
| | Refrigerator | 1 | |
| | Air conditioner | 1 | |
| | Wardrobe | 1 | |

## Furnishings Cleaned, Upholstered or Refinished

Some household furnishings were cleaned commercially, upholstered, or refinished by three-fourths of the families either before or immediately after moving (Table XXI). The families tended to have furnishings cleaned before moving but refinished after moving. Rugs were reported as cleaned before moving by sixteen families; draperies by seven families, and slipcovers by five families. The items of furniture refinished after moving mentioned by two families or more were chest, desk, bed or table.

TABLE XXI

HOUSEHOLD FURNISHINGS CLEANED, UPHOLSTERED OR REFINISHED FOR THE NEW HOME
(29 families who reported furnishings cleaned, upholstered and/or refinished)

| Process | Household furnishings | Number of families | |
|---|---|---|---|
| | | Before moving | After moving |
| Cleaned commercially | Rugs | 16 | 5 |
| | Draperies | 7 | 3 |
| | Slipcovers | 5 | 1 |
| | Bedspreads | 3 | 0 |
| | Platform rocker | 0 | 1 |
| | Sofa | 0 | 1 |
| Upholstered | Chair | 5 | 2 |
| | Sofa | 0 | 2 |
| Refinished | Chest | 0 | 5 |
| | Desk | 0 | 3 |
| | Bed | 1 | 2 |
| | Table | 2 | 2 |
| | Bedroom suite | 0 | 1 |
| | Piano | 0 | 1 |
| | Dresser | 0 | 1 |
| | Phonograph | 0 | 1 |
| | Bookcase | 0 | 1 |

## Makeshifts Used

One or more items of makeshift furnishings were used in six homes (Table XXII). Makeshifts were used in the living room and in the dining room more than in the bedroom and kitchen.

TABLE XXII

MAKESHIFTS USED TO FURNISH THE HOME
(6 families who reported using makeshifts)

| Type of makeshift | Number of families used makeshifts |
|---|---|
| Living room | |
| All furnishing in living room | 2 |
| Draperies | 2 |
| Kitchen | |
| Card table for work space | 1 |
| Cabinets in kitchen | 1 |
| Dining room or eating area | |
| Dining table borrowed | 2 |
| Breakfast set borrowed | 1 |
| Kitchen cabinet for storage in dining area | 1 |
| Master bedroom | |
| Over the door hangers for storage of clothes | 1 |
| Wardrobe boxes covered with contact paper for clothes storage | 1 |
| Kitchen cabinet to store household records | 1 |

## Permanent Improvements Constructed

Permanent improvements constructed to make the home more livable were made by fourteen families (Table XXIII). Five families improved storage facilities; four families built one or more items of furniture.

TABLE XXIII

CONVENIENCES MADE BY THE FAMILY TO MAKE THE HOME MORE LIVABLE
(14 families who had made conveniences)

| Conveniences | Number of families |
|---|---|
| Storage | |
| Shelves in storage or utility room | 3 |
| Shelves in bedroom closet | 1 |
| Closet in den converted into space for the television and storage space with shelves | 1 |
| Clothes hamper built in bathroom | 1 |
| Bathtub enclosure | 3 |
| Furniture built | |
| Room divider separating eating area from the living room | 2 |
| Two end tables | 1 |
| Matching lamp tables and chess table (child size) | 1 |
| Kitchen remodeled | 1 |
| Ceramic tile in bathroom | 1 |

## Furnishings and Equipment Purchased

All of the families reported purchasing furnishings or equipment for the new home. However, there was a wide range in the cost of many of the purchases. Furnishings and equipment purchased for the new home are as follows:

| | | | |
|---|---|---|---|
| Small equipment | | | 108 |
| Light bulbs | 26 | | |
| Shelf paper | 26 | | |
| Garbage cans | 19 | | |
| Picture hooks | 17 | | |
| Towel racks | 11 | | |
| Small kitchen equipment | 7 | | |
| Storage cabinets | 3 | | |
| Clothes line and post | 2 | | |
| Mail boxes | 1 | | |
| Doorbell | 1 | | |
| Fireplace equipment | 1 | | |
| Small cleaning equipment | 1 | | |
| Television antenna | 1 | | |
| Window treatment | | | 77 |
| Curtain rods | 26 | | |
| Curtains | 23 | | |
| Draperies | 16 | | |
| Drapery fixtures | 11 | | |
| Venetian blinds | 1 | | |
| Window shade | 1 | | |
| Furniture | | | 36 |
| Tables | | 11 | |
| End | 5 | | |
| Coffee | 3 | | |
| Dining | 1 | | |
| Kitchen | 1 | | |
| Night | 1 | | |
| Chairs | | 7 | |
| Living room | 5 | | |
| Rocking chair | 2 | | |
| Rugs | | 7 | |
| Room size | 5 | | |
| Throw | 2 | | |
| Bedroom furnishings | | 9 | |
| Bedroom suite | 4 | | |
| Mattress | 3 | | |
| Twin beds for children's room | 2 | | |

| | | |
|---|---|---|
| Case goods | | 7 |
| Chest of drawers | 3 | |
| Desk | 1 | |
| Dresser | 1 | |
| Room divider | 1 | |
| Television | 1 | |
| Accessories | | 34 |
| Lamps | 12 | |
| Shower curtains | 12 | |
| Waste basket | 7 | |
| Pictures | 2 | |
| Green plant | 1 | |
| Large equipment | | 17 |
| Refrigerator | 4 | |
| Stove | 4 | |
| Air conditioner | 2 | |
| Freezer | 2 | |
| Washing machine | 2 | |
| Dryer | 2 | |
| Lawn mower | 1 | |
| Vacuum cleaner | 1 | |

## The Suggestions for Other Families Buying Furniture Who Expect to be Transferred

| | | |
|---|---|---|
| Construction | | 25 |
| Durable | 11 | |
| Sturdy well built pieces | 8 | |
| Good construction | 1 | |
| Strong | 1 | |
| Substantial | 1 | |
| Material serviceable | 1 | |
| Light weight | 1 | |
| Heavy | 1 | |
| Adaptability | | 18 |
| Adaptable | 7 | |
| Adaptable to different houses | 3 | |
| Adaptable to other rooms | 2 | |
| Adaptable to other climates | 1 | |
| Do not buy for one particular spot | 1 | |
| Dual purpose | 1 | |
| Buy chests instead of end tables | 1 | |
| Living room and dining room furniture which can be used interchangeable | 1 | |
| Furnishings of one style and use interchangeable | 1 | |
| Amount | | 16 |
| Buy only what you need | 7 | |
| Buy all the furniture you want | 2 | |
| Limit the amount of furniture | 2 | |
| Limit the amount of accessories | 2 | |
| Limit the amount of outdoor furniture and equipment | 1 | |
| Keep toys at a minimum | 1 | |
| Don't buy furniture | 1 | |
| Size | | 15 |
| Small | 11 | |
| Apartment size range and washing machine | 1 | |
| Do not buy large appliances | 1 | |
| Medium | 2 | |
| Finishes | | 15 |
| Light in color | 11 | |
| Scarproof | 3 | |
| Plastic top tables | 1 | |

| | | |
|---|---|---|
| Color | | 12 |
| Neutral color scheme | 5 | |
| Neutral color schemes and tie in color with accessories | 2 | |
| Neutral colors for large pieces use bright colors for accent | 1 | |
| Color schemes which will adapt to all furnishings | 1 | |
| Color scheme about the same for all furnishings | 1 | |
| Color for slipcovers different from the upholstery fabric (can use either) | 1 | |
| Materials that will fit into any color scheme | 1 | |
| Materials | | 11 |
| Hard wood | 3 | |
| Soft wood | 3 | |
| Maple | 3 | |
| Wrought iron | 2 | |
| Cost | | 10 |
| Inexpensive | 4 | |
| Inexpensive curtain and draperies | 1 | |
| Second hand furniture | 1 | |
| Moderately priced | 4 | |
| Type of furniture | | 5 |
| Contemporary furniture | 2 | |
| Sectional furniture | 1 | |
| Folding furniture when suitable for the purpose | 1 | |
| Foam rubber mattress easy to pack and lightweight | 1 | |
| Quality | | 4 |
| Buy what you want to keep | 4 | |

# CHAPTER VII

## SUMMARY, CONCLUSTIONS AND RECOMMENDATIONS

This study was made to determine the housing and furnishings experiences families encounter in moving and settling in a new location when transferred by their employer.

The writer interviewed 40 homemakers in their homes, using a prepared interview schedule. The families lived in the city limits of Greensboro, had been transferred by their employers, and had at least one child ten years of age or younger.

### The Families

The family members consisted of mother, father and one or more children with the exception of one family in which the homemaker's mother lived in the home. Approximately one-half of the families had four members, one-fourth had three members, and one-fourth had five or more members.

The length of time the families had lived in Greensboro ranged from one week to five months. Only one-half of the families had information about Greensboro before moving. Usually, this information had been acquired either from personal experience of living in Greensboro or vicinity, or contact with a former resident.

The families represented thirty-one employers. The company employing the largest number of families was Burlington Industries, whose home office is located in Greensboro.

Financial assistance was usually given to the employee and his family before and during the moving process rather than after moving and

getting settled in the new home. Only three families reported reimbursement of financial loss on real estate but several families indicated the willingness of their employer to make up such a loss if there had been any incurred. Employees of companies organized on a national or international level received more financial assistance from their employer than smaller companies.

## Dwelling

All of the families assumed the responsibility of finding the new home. The two sources of assistance used most frequently were real estate agents and/or real estate listings in the newspaper.

Location was mentioned most frequently by the families as a reason for selecting the new dwelling. However, one-fourth of the families stated only one reason - the only one available; most of these families lived in apartments and many considered it temporary quarters until suitable housing could be located.

Twenty-five families lived in houses and fifteen of these families had bought the house prior to moving. Fifteen families lived in apartments. Those who lived in apartments either considered them temporary until more suitable living quarters could be located or the families had tried to keep their furniture at a minimum so it would fit into an apartment.

All the dwelling units were cleaned before the families moved in with their household furnishings; one-half of them were cleaned by the contractor, former owner, or landlord. Sixty per cent of the dwellings were freshly painted either completely or partially before the families moved in with household furnishings.

## The Moving Process

All of the families had four rooms or more of household furnishings to move. All families except those of two employers assumed the responsibility of selecting the transfer company and making the arrangements for moving. The two families had employers who had a transfer company under contract to move transferred employees.

More families had movers to pack than to unpack. Perhaps the reasons were (1) that the moving companies were responsible for only what they packed, and (2) that some of the homemakers preferred to do their unpacking so they could place and arrange furnishings so they would be easier to find later.

A diversity of opinions was shown in the suggestions for other families planning a move. Many of the suggestions showed ingenuity and preplanning for the moving of household furnishings. Most of the suggestions were concerned with the packing and unpacking and had to do with "who" and "how". Of the families making suggestions it was evident that the most pertinent suggestions came from the homemakers who had the experience of two or more moves.

## Adapting Furnishings to the New Home

Few of the families had the opportunity to take an active part in planning the new house. Therefore, as might be expected, approximately three-fourths of the families had problems of adapting furnishings to one or more rooms. The problem usually was the lack of space or the piece of furniture or equipment was too large or out of scale for the existing space.

Families living in apartments had more problems in the children's bedroom and in the dining area; those living in houses had more problems in the work area and master bedroom. About an equal proportion of families living in houses and in apartments had problems in adapting furnishings in the living room.

More families had problems in the children's bedroom than any other room. In contrast, fewer families had problems in the master bedroom than any other room.

Lack of adequate toy storage space was mentioned most frequently by the families who had problems in the children's bedroom. Either the storage of toys was not considered adequately by the builder in planning the children's bedroom or the amount of space required to store toys was not considered sufficiently by the family at the time of purchase.

The solution used in the dining area and master bedroom by most of the families was using the best arrangement possible with the available space.

The solution used in the work area usually was to use the piece of furniture or equipment in another room or supplementary area.

In the living room there was a tendency to replace furnishings with a smaller model or use the best arrangement possible with the available space. Apparently, many of the families, in choosing the dwelling, did not give sufficient consideration to fitting their furnishings into the space.

One-fourth of the families had furnishings stored with family or friends, or in commercial storage. More families living in apartments had furnishings stored than families living in houses.

Three-fourths of the families had furnishings cleaned or upholstered, or refinished either before or immediately after moving. There was a tendency for the families to have rugs, draperies, and slipcovers cleaned before moving and furniture refinished after moving.

A small number of families reported using makeshifts in one or more rooms; usually it was improvised storage for items used in the particular room. However, none of the families reported using makeshifts in the children's bedroom where the largest number of families had problems.

Over one-third of the families constructed some permanent improvements for the new home; usually it was improved storage facilities in the bedroom or utility room. Most of the families making improvement did so in houses they had purchased.

All of the families purchased some furnishings or equipment for the new home, usually to meet a particular need. The most frequently purchased items were small equipment and items for window treatments. However, many families purchased furniture and large equipment. Tables were mentioned by more families than any other item of furniture.

In making suggestions to other families who expect to be transferred and are buying furniture, the features mentioned were (1) durability of construction materials and finishes, (2) adaptability of furnishings to different rooms, houses and climates, and (3) furnishings limited in amount, small in size, neutral in color, and inexpensive.

## Problems Involved

From the experiences encountered by this limited sampling of families transferred by their employers, there are indications that there are problems

relative to:

Selecting furnishings adaptable to different settings.

Obtaining general information about the new community.

Locating the new home.

Packing and unpacking the household furnishings.

Adapting the furnishings to the new dwelling.

Making the best arrangement possible.

Using or storing in another room.

Selling, buying, trading, and altering.

Cleaning, upholstering, and refinishing furniture.

Storing in basement, in commercial storage, or with family, or giving away.

Building conveniences and using makeshifts.

## Possible Aids in Solution of Problems

In the opinion of the writer, more help could be given in the solution of these problems by companies transferring employees, by communities with a rapid turnover in the population, and by educators. For example, the booklet Moving Made Easier, recommended by the American Home Economics Association, contains valuable information on locating the new home and moving household furnishings. It includes suggestions similar to those made by the transferred families in this study and other suggestions. None of the families knew about this booklet. Wider distribution of this booklet would help with these particular problems.

Assembly of information on other topics pertinent to moving in such form would be very helpful.

Consultation service is another form in which such information could be given.

## Further Research Recommended

Studies need to be made of the housing needs, preferences, and space requirements of young urban families, similar to those now being carried on for rural families and the results made available to builders of apartments and of houses for sale or rent. This seems to be especially needed for the work area and the children's bedroom.

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# BIBLIOGRAPHY

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# APPENDIX

EXPERIENCES IN MOVING ENCOUNTERED BY FAMILIES TRANSFERRED BY THEIR EMPLOYER

## I. General Information

Name _____

Number in household _____ Age of youngest child _____ Oldest _____

When did you move to Greensboro? _____

Employer _____

Did you know anything about Greensboro before coming? _____Yes _____No.

If so, from what source? _____

What information? _____

What form? _____

## II. Assistance by the Company to the Transferee in Moving

A. Did the company finance any of the following:

Expenses while house hunting for family members? Number _____ _____All _____Part _____None

An expense account for the husband before the family moved? _____All _____Part _____None

Husband's expenses for visits home? _____All _____Part _____None

Loan for down payment on new home? _____All _____Part _____None

Payment of rent for new home? _____All _____Part _____None

For how long? _____

Shipment of household furnishings? _____All _____Part _____None

Other (list) _____

B. Did the company make up any financial losses incurred in the move?

Loss in selling the house _____All _____Part _____None

Unexpired lease _____All _____Part _____None

Other (list) _____

## III. Locating the New Home

A. When you first moved to Greensboro, did you live in an ___apartment ___house?

If a house, did you _____buy _____rent?

If rented, for how long? _____

B. How did you locate the house (apartment) into which you first moved?

Advance trip to Greensboro by ___Family _____Husband _____Wife

_____Other (list) _____

_____Search after arrival of family

_____Search after arrival of household furnishings

C. What were the main reasons for selecting the house (apartment)?

_____

_____

_____

D. What assistance was used in locating the house (apartment)?

_____Real estate agent

_____Real estate listings in newspaper

_____Other (list) _____

E. Is this the first house (apartment) which you have lived in Greensboro?

_____Yes _____No.

If no, why did you move?

_____Desire for ownership

_____Larger house

_____Larger yard

_____Better neighborhood

_____Closer proximity to a social group

_____More convenient to church

_____More convenient to husband's work

_____More convenient to school

_____More convenient to a shopping center

_____Other (list) _____

F. Did you _____rent or _____buy the house?

## IV. Moving

A. Is this the first time you have moved household furnishings when being transferred? _____Yes _____No. If no, how many times? _____

B. Did you have a full truck load (5000 lbs) of household furnishings? _____Yes _____No.

C. Did your household furnishings arrive on schedule? _____Yes _____No.

If no, what living arrangement did you make? _____

_____

D. Who packed the household furnishings? _____

E. Who unpacked the household furnishings? _____

F. In the process of moving did you store your furnishings? ____Yes ____No.

Where did you store them? _____

When did you store them? _____

G. Do you have any furnishings in commercial storage because you do not have space in your present home? _____Yes _____No.

What type of furnishings? _____

Why did you store these furnishings? _____

H. Do you have any furnishings stored with family or friends? ____Yes ____No.

What type of furnishings? _____

Why did you store these furnishings? _____

J. What furnishings needed to be cleaned commercially?

| Articles | Before moving | After moving |
|---|---|---|
| ____Bedspreads | ____ | ____ |
| ____Draperies | ____ | ____ |
| ____Rugs | ____ | ____ |
| ____Slip covers | ____ | ____ |
| ____Other (list) | ____ | ____ |
| ____ | ____ | ____ |

K. What furniture needed to be refinished?

| Articles | Before moving | After moving |
|---|---|---|
| ____Chair | ____ | ____ |
| ____Chest | ____ | ____ |
| ____Table | ____ | ____ |
| ____Other (list) | ____ | ____ |
| ____ | ____ | ____ |

L. Who cleaned the house before you moved in? _____

M. Was the interior of the house freshly painted before you moved in?
____Yes ____No ____partially. Who had it done? _____

## V. Getting Settled in the New House

A. How long was it before the family was reasonably settled in the new house?

_____

B. Which furnishings did not adapt easily to the new house?

| Room | Problem | Solution |
|---|---|---|
| Living room | | |
| Kitchen | | |
| Dining room or eating area | | |
| Master bedroom | | |
| Children's bedroom | | |

C. What accessories did you have to purchase in getting settled?

| | | |
|---|---|---|
| ____Curtains | ____Garbage cans | ____Shower curtains |
| ____Curtain rods | ____Lamps | ____Towel rack |
| ____Draperies | ____Light bulbs | ____Waste baskets |
| ____Drapery fixtures | ____Shelf-paper | ____Other (list) |

D. Did you have to purchase any of the following?

| Furniture | Large equipment | Small equipment |
|---|---|---|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

E. What makeshifts have you made to furnish your home? _____

_____

_____

_____

_____

F. What conveniences have you made to make your house more livable? _____

_____

_____

_____

## VI. Helpful Suggestions from Families Based on Their Experiences in Moving

A. What have you learned in moving which you feel would be helpful to another person planning a move?_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

B. In making purchases of household furnishings, what do you consider good characteristics in furniture for moving?

Durability _____

Flexibility _____

Ease in moving _____

Adaptability _____

Other (list) _____

_____

_____

_____

_____

_____

_____

C. What suggestions would you make to a person buying furniture, who expects to be transferred from time to time by the company? _____

# THE EFFECTS OF SELECTED SYNTHETIC DETERGENTS UPON THE WHITENESS RETENTION OF DACRON AND COTTON FABRICS AND SIMILAR ALL-COTTON FABRICS

by

Virginia Jane Edwards



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# CHAPTER I

## INTRODUCTION

Dacron and cotton blend fabrics are one of the best sellers on the market today. This dynamic blend of 65 per cent Dacron and 35 per cent cotton is being sold in a great variety of garments. Its major sales at the present are as dresses, blouses and men's shirts.

Recent studies have shown that the price conscious consumer prefers Dacron and cotton fabrics over all-cotton ones.[1] One of the most exciting things about this fabric is that it combines both the comfort and the good looks of the cotton with the strength and easy maintenance qualities of Dacron. The Dacron and cotton garment can be washed and allowed to drip dry overnight.[2]

Due to the fact that Dacron and cotton blend fabrics are relatively new on the market, little research has been done on them other than that done by the manufacturers of the synthetic fiber. However, in the several studies which have been published the properties suggested as needing more attention have been those of soil removal and the retention of the original whiteness.

This study, a part of a research project in progress at the School of Home Economics at The Woman's College of the University of

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[1] "Dacron and Cotton," American Fabrics, XXXIX (1957), 38.

[2] Jerome Campbell, "Dacron and Cotton Form Happy Union," Modern Textile Magazine, XXXV (February, 1954), 52.

North Carolina,[3] was undertaken to compare the whiteness retention properties of Dacron and cotton blends with those of similar all-cotton fabrics. In directing attention to this property, it was also possible to study the effect of certain selected synthetic detergents on the whiteness retention properties of the two types of fabrics.

A review of literature is detailed in Chapter II. This is composed of a discussion of the whiteness retention properties of Dacron and cotton blend fabrics and the effect of synthetic detergents upon whiteness retention. In Chapter III are presented the actual steps taken in preparing and testing the fabrics. In this chapter are also discussed methods of evaluation. The data which were compiled from laboratory tests are presented and analyzed in Chapter IV. The final chapter contains a summary of the entire study, conclusions, and recommendations for further study.

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[3] Pauline E. Keeney, "The Serviceability of Fabrics Made of Dacron and Cotton for Use in Shirts and Blouses." (North Carolina Agricultural Experiment Station, Project H-77, Raleigh, North Carolina, 1954).

# CHAPTER II

## REVIEW OF LITERATURE

### I. RESEARCH ON DACRON AND COTTON

Little research has been done on Dacron and cotton blend fabrics other than that done by the manufacturer of the synthetic fibers, therefore there is little material available concerning its whiteness retention properties. However, there are several studies which should be mentioned. One of these was conducted by a home economics teacher, without the use of laboratory equipment. A low-price shirt was purchased to be worn by one person. It was worn and laundered and allowed to drip dry. It was found that the Dacron and cotton blended fabric became dingy around collar and cuffs after continuous launderings, although bleaches were used. It was also found that perspiration could not be removed completely even when bleaches were used. The conclusions of the study are that the shirts were comfortable, easily cared for, and if they could be whitened, they could be worn many more times.[1]

Consumer's Research has also done some research on Dacron and cotton blends. They found that the wrinkle resistant qualities disappeared gradually and the shirt needed to be pressed after the fifteenth laundering. They also found that soil around the collar became increasingly

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[1] Eunice M. Sandgren and Duane L. Sandgren, "Home Test of a Dacron-Cotton Shirt," Journal of Home Economics, XLVIII (November, 1956), p. 693-694.

harder to remove and a considerable amount of pilling appeared on the collar and around the cuffs.[2]

A third study has been conducted by Keeney on the performance of Dacron and cotton shirts as compared with similar all-cotton shirts. For this study 40 Dacron and cotton and 31 all-cotton shirts were purchased. Ten men were selected to wear the shirts. After nine months of wear the following was concluded:[3]

> Wrinkling during wear was the feature noted with greatest frequency in both Dacron and cotton and all-cotton garment groups. The warmth of the fabric, presence of static electricity, changes in color and retention of soil did not support the claims for comfort and attractive appearance in Dacron and cotton garments.
>
> Neither was proper care of the garments as simple as stated on hand tags and in advertising material.[4]

Dacron, a polyester fiber, is manufactured by the duPont Company from a polymer called polyethylene terphthatate. The polymer was invented in England and is an outgrowth of earlier work that was done in the United States by Carothers. In England the fiber is called "Terylene."[5] The commercial production of Dacron began in 1953 in Kinston, North Carolina.[6]

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[2] "Men's White Shirts," Consumer's Research Bulletin (January, 1955), p. 15.

[3] Pauline E. Keeney, "Performance of Dacron-and-Cotton Shirts Compared with All-Cotton Garments of Similar Construction," Journal of Home Economics XLIX (March, 1957), pp. 187-191.

[4] Ibid., p. 191.

[5] Leonard Mauer and Henry Wechaler, "Modern Textile Handbook," Modern Textiles Magazine, XXXIV, March, 1953, 82.

[6] Isabel B. Wingate, Textile Fabrics and Their Selection, (4th edition; New York: Prentice-Hall, Inc., 1955), p. 381.

This truly synthetic fiber is highly resistant to laundry detergents, to sodium hypochlorite, and to sours. It absorbs a very small amount of moisture and therefore dries very quickly.[7] Dacron has become very popular because of this quick drying property and also because of its "good wrinkle-recovery properties."

Many of the physical properties of cotton are very much different from those of Dacron. It is a sturdy fiber that wrinkles easily. Cotton picks up soil and stains easily and absorbs moisture readily. It requires a longer drying period than any other fiber.[8] Laundering cotton presents two problems---removing soil and preventing soil from redepositing.

Since cotton and Dacron have such different properties, what are the outcomes of combining the two into one fabric? The fabric strength of the blend is lower than all-cotton unless as much as 60 per cent Dacron is used. This blending of Dacron and cotton fibers has produced an extremely popular wash-wear fabric. "Wash-wear is a term used to denote fabrics that resist wrinkling even when wet, and retain their press and appearance through a normal home laundering period and yet look good enough to be worn without pressing."[9]

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7 G. H. Johnson, "Launderable Textiles in 1955," American Dyestuff Reporter, XXXXV, (February 27, 1956), 127.

8 All About Laundering, Reference Manual, Consumer Education Department, (Saint Louis, Missouri: Monsanto Chemical Company), Section X, Cotton, (n.p.)

9 James S. Ramsey, "How to Handle Dacron-Cotton Blends," Modern Textiles Magazine, XXXVI, (July, 1955), 69-70.

## II. DETERGENTS AND DETERGENT ACTIONS

This particular study does not involve the redeposition of soil since no soil was applied to the test fabrics. It is concerned with the effect of certain detergents on the whiteness retention of Dacron and cotton blends at certain intervals of laundering and required an extensive study of the composition and action of detergents.

Detergents have certain fundamental actions which have been agreed upon. The first of these is that the detergent must cause the liquid to wet the object to be washed, or come in contact with the dirt, the surface to be cleaned and with the air that surrounds the surface. Second, the detergent must cause the dirt to be removed from the surface by the liquid and to be held in suspension. Third, the detergent must produce some electrical attraction that will prevent the dirt from redepositing on the surface that has been cleaned. Fourth, often some chemical action is involved in the operation of the detergent, however, this is generally a minor factor.[10]

The production of synthetic detergents is a highly complex process by which petroleum derivatives or fatty oil derivatives are completely changed chemically.[11] Synthetic detergents were first used in Germany during World War I when soap was scarce.[12]

Soaps and detergents possess some of the same characteristics,

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[10] Sidney M. Edelstein, "Detergents for Textiles," Soap and Sanitary Chemicals, (September, 1951), p. 36.

[11] Right on the Line, (Jersey City, New Jersey: Colgate-Palmolive Company, 1952), p. 5.

[12] All About Laundering, op. cit., p. 1.2, Section VII.

however, they are different in many ways. Each has certain advantages over the other and each performs best under certain conditions. Some of the advantages of detergents are:

1. Greater cleansing efficiency - Detergents do not combine with the calcium, magnesium and other salts that are present in water, thus there is no waste.

2. Removes lime-soaps from clothes - Soap deposits that cause stiffness and a gray appearance are removed.

3. Greater efficiency against acids - This is a definite advantage when laundering certain garments that become impregnated with acid soil.

4. Soluble in cold water - Unlike soaps, detergents work effectively even in cold water.

5. Rinsing may be omitted when the water supply is limited.

6. More than one deep, clear water rinse is unnecessary.[13]

Both soap and synthetic products are surface-active agents. The structures of the two are also fundamentally similar. One characteristic of all surface-active agents is that they have a molecule which carries a hydrophobic (water-repelling) hydrocarbon tail and a hydrophillic (water-attracting) head. "When a detergent dissolves in water, the surface molecules are oriented so that their cationic heads point toward the water and the hydrocarbon tails away from it."[14] As the detergency of soap is dependent to some extent on the oils from which they are derived and also upon their cationic head, so are the properties of the synthetics directly related to the type and length of their hydrocarbon chain and also to the nature of the cation.[15]

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[13] Right on the Line, op. cit., p. 6.

[14] E. G. Thommassen, and John W. McCutcheon, Soaps and Detergents, (New York: MacNair-Dorland Company, 1949), p. 399.

[15] Ibid., p. 400.

Detergents have been classified as follows:

1. Anionic detergents - When these detergents are dissolved in water, they ionize to give particles that have positive and negative charges. The working part of the anionics is these negative particles, the anions. This group includes the bulk of the detergents being used today.

2. Cationic detergents - When detergents belonging to this group are dissolved in water, they also ionize to form particles that have positive and negative charges, however, the working part of this group is the positive particle, the cation. Cationic detergents are not used much and are usually known to the public as water softeners.

3. Nonionic detergents - Members of this group do not ionize when dissolved in water. They do not precipitate with salts, acids, alkalies, or with ionic detergents.[16]

Detergents have been further classified into various types according to their chemical structure. Some of these types are:

Alkyl Sulfates. Detergents in this group are stable, odorless and highly resistant to decomposition by acid or alkali. They are compatible with soaps, and unaffected by hard water. Since they are derived from the same fatty acids, there are some similarities between soaps and this type of detergent.[17]

Alkyl Aryl Sulfonates. Detergents in this class have a good lather which can be increased by the addition of an alkali. However, the lather is not as good as that of the alkyl sulfate group, nor does it stand up under high temperatures. They are resistant to bleaches, oxidizing agents, boiling 10 per cent acid, and boiling 10 per cent alkali.

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[16] Edelstein, op. cit., p. 36.

[17] Ibid., p. 402.

These alkyl aryl sulfonates are not as resistant to hard water as the alkyl sulfates, but are effective in water up to 3000 parts per million hardness.[18]

Alkyl Sulfonates. Due to the chemical structure of this group, it stands midway between the alkyl sulfates and the alkyl aryl sulfonates in stability and in detergency. This type of compound was used extensively in Germany during World War II to replace soap.[19]

Sulfated, Sulfonated Amides. The synthetic detergents that are in this group are characterized by having excellent detergency and excellent stability qualities. They have a fine foam which is very stable.[20]

Sulfated, Sulfonated Esters. The detergents that belong to this group are excellent detergents, however they are not stable to strong acid nor alkali. Hard water does not have any effect on them.[21]

Miscellaneous. Other types are possible, but since they usually include only isolated examples, they will not be discussed here.[22]

## III. MAINTENANCE OF FABRIC WHITENESS

One of the problems that the homemaker encounters in laundering is that of keeping white clothes white after several launderings. This loss of whiteness can be caused by several things. Many of our fibers

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[18] Ibid., p. 403-404.

[19] Ibid., p. 404-405.

[20] Ibid., p. 405.

[21] Ibid., p. 406.

[22] Ibid., p. 407.

are not completely white when they are produced, therefore the manufacturer uses bleaches on them. After a few launderings these fabrics return to their unbleached state.[23] Some other causes for the loss of whiteness are unremoved soil and the hard-water soap scum caused by inefficient laundering methods and out-of-date laundering products.[24]

The manner in which the dirt is attached to the cloth also affects the whiteness retention properties of the fabric. When a cloth upon which dust has collected is shaken, part of the dust is removed but some still clings to the surface of the fabric, thus the cloth is left dirty. The type of fabric and its construction determine its ability to hold dirt and its capacity to react with the detergent solution. The nature of the fiber surface is also important. Rough fibers will tend to hold more soil than smoother ones.[25]

Brightening Agents and Builders. There are two methods for making a fabric appear whiter. One is the old method of using blue dye or pigment, the other is the use of fluorescent whitening agents. According to Weidmann, "A fluorescent brightener absorbs little or no visual light but utilizes the invisible ultraviolet portion of light energy, converting this to longer wave lengths of visible blue light." Since the impurities in fabrics are usually yellow, this addition of

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[23] All About Laundering, op. cit., section 1, p. 2.7.

[24] Right On the Line, op. cit., p. 38.

[25] Bruce E. Hartsuch, Introduction to Textile Chemistry, (New York: John Wiley and Sons, Inc., 1950), p. 70-71.

blue light to the reflectance of the undyed surface produces a better spectral balance, the result of which is improved whiteness.[26]

The light that is emitted by the fluorescent whitener has two functions; one is to counteract the yellowness, and the other function is to make the fabric lighter. Both of these functions help to make the fabric appear whiter.

Several methods have been worked out for evaluating the amount of fluorescent bleach that is present in a fabric. They are as follows:

1. Visual examination in daylight
2. Visual examination under ultraviolet illumination
3. Use of fluorimeter
4. Use of fluorimeter with correction factor
5. Use of redesigned fluorimeter

The first three of the methods do not produce reliable results, the fourth requires specialized equipment, and the fifth is new and has not been perfected yet.[27]

The effectiveness of these optical bleaches on fabrics is very impressive in comparison with an ordinary bleached cloth.[28] "The evidence of the effectiveness of well selected brightening agents is so clear that a detergent manufacturer can hardly afford not to use them, especially as they are used in such minor percentages.[29]

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26 Dr. Charles J. Weidmann, "Making White White," American Fabrics, XXXIX (1957), 78.

27 Eugene Allen, "Evaluation of Whitening Efficiency of Fluorescent Whitening Agents," American Dyestuff Reporter, XXXXVI, (June 17, 1957), 431.

28 "Optical Bleaches Intensify Whiteness," Modern Textiles Magazine, XXXVII, No. 10, (October, 1956), 70.

29 Jay C. Harris, Detergency Evaluation and Testing, (New York: Interscience Publishers, Inc., 1954), p. 190.

Builders are alkaline materials that have been added to soap or synthetic detergents. These are added to offset the effect of certain minerals in hard water and to increase the alkalinity of the laundering solution. Even though synthetic detergents are not impaired by hard water, a builder must be added before they will clean cottons efficiently. The addition of these builders also reduces the amount of detergent that is needed.[30]

Builders are often added to synthetic detergents for the purpose of maintaining a certain pH level. Most built detergents that come in contact with the hands have a pH of 10.5 in order that skin irritation will be avoided.[31]

The pH is a means of measuring acidity or alkalinity of a product in solution. The pH range is 1 to 14. A pH of 1 is highly acid and a pH of 14 is highly alkaline. A pH of 7 is neutral--neither acid nor alkaline.[32]

Highly alkaline solutions are harmful to fabrics, however, some alkalinity is necessary for good laundering results, especially for cotton fabrics.[33]

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[30] Soap and Other Detergents, (Chicago: Consumer Education Department, Household Finance Corporation, 1949), p. 5.

[31] Harris, op. cit., p. 194.

[32] All About Laundering, op. cit., Section I, p. 1.7.

[33] Ibid., Section I, p. 1.7.

# CHAPTER III

## METHOD OF PROCEDURE

### I. FABRICS USED IN THE STUDY

For this study, six white shirt fabrics were chosen, two all-cotton batiste, two Dacron and cotton batiste, one all-cotton Oxford cloth and one Dacron and cotton Oxford cloth. Four samples which measured ten inches by twelve inches were cut from each of these six fabrics. These samples were coded as follows:

| All-Cotton Fabrics | | | Dacron and Cotton Fabrics | | |
|---|---|---|---|---|---|
| Batiste | | Oxford | Batiste | | Oxford |
| B-1a | B-2a | O-3a | XB-6a | XB-8a | XO-4a |
| B-1b | B-2b | O-3b | XB-6b | XB-8b | XO-4b |
| B-1c | B-2c | O-3c | XB-6c | XB-8c | XO-4c |
| B-1d | B-2d | O-3d | XB-6d | XB-8d | XO-4d |

These fabrics were laundered with four synthetic detergents which are designated as A, B, C, and D.

### II. DETERMINATION OF LIGHT REFLECTANCE

The light reflectance of the fabrics was determined with a Hunter Reflectometer, an instrument developed to measure differences in apparent reflectance, gloss, or color. Because of its high precision, the instrument is well suited for measuring small differences in nearly identical samples.[1] A number of readings were made on the original

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[1] Richard S. Hunter, "A Multipurpose Photoelectric Reflectometer," Journal of Research of the National Bureau of Standards, (November, 1940), pp. 581.

fabrics using the green, blue, and amber filters. The average of the readings from the three filters was reported as the per cent light reflectance.

## III. LAUNDERING PROCEDURE

Ten by twelve inch swatches of the six fabrics were laundered with four different commercial detergents. Two of the detergents, A and B, were built alkyl aryl sulfonates;[2] one, C, was a lightly built alkyl sulfate;[3] and one, D, contained a builder and was both alkyl sulfate and alkyl aryl sulfonate.[4]

These samples were washed in a L-2-Q Launder—Ometer, a machine originally devised for obtaining the degree of fastness of dyes to laundering.[5] The apparatus was equipped with one-half gallon jars in which the samples were placed with 500 millileters of water and 0.5 gram of detergent. The temperature of the jars was kept at 105°F. by a water bath. The apparatus made it possible to control each of the factors that influence detergency, such as, concentration of detergent solution, temperature, agitation and the length of the laundering period.[6] The

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2 "Syndets Classification and Uses." What's New in Home Economics, (October, 1956), p. 62; and John W. McCutcheon, Synthetic Detergents and Emulsifiers, (New York: MacNair-Dorland Company, Inc., 1955), p. 58; and Ibid., p. 23.

3 What's New in Home Economics, op. cit., p. 63; and E. G. Thomssen and John W. McCutcheon, Soaps and Detergents, (New York: MacNair-Dorland Company, 1949), p. 492.

4 W. S. Carter, (The Procter and Gamble Company), Correspondence, April 3, 1958.

5 John Skinkle, Textile Testing, (Brooklyn, New York: Chemical Publishing Company, Inc., 1948), p. 117.

6 Donald Price, Detergents - What They Are and What They Do, (New York, Chemical Publishing Company, Inc., 1952), p. 129.

samples were laundered for 30 minutes then rinsed and allowed to drip dry. After they were dry, they were pressed on the wrong side so as to avoid producing a gloss on the right side of the fabric. Reflectancy readings were taken after the first, second, fifth, tenth, twentieth, thirty-fifth, and fiftieth launderings. These readings were averaged to obtain the change in reflectance during progressive laundering.

## IV. DETERMINATION OF WATER HARDNESS AND pH OF LAUNDERING SOLUTION

Since it was not possible to obtain distilled water for the number of launderings necessary, the Greensboro City water was used. The water hardness was determined by using the standard test for water hardness.

This test is performed by adding green soap, one drop at a time, to one ounce of water. The addition of soap is continued until a head of suds is formed that stands for five minutes. The water is considered to be as hard as the number of drops of tincture of green soap used to form the head of suds. For example, if 10 drops of green soap are used, the water is said to be 10 grains hard per U. S. gallon.[7]

The alkalinity of the laundering solutions was determined by the use of a pocket potentiometer[8] following the procedure accompanying the instrument.

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7 Water Hardness Test, p. 4.1, Section VIII, All About Laundering, Reference Manual, Consumer Education Department, Monsanto Chemical Company, Saint Louis, Missouri.

8 Manufactured by Analytical Measurements, Incorporated, Chatham, New Jersey.

## V. OPTICAL BLEACHES

It was believed that some, if not all of the four synthetic detergents that were used for this study contained an optical bleach or brightening agent. Hunter, in his instruction book, says that optical bleaches have some effect on the reflectance readings.[9] In order to determine which detergents contained bleach, simple tests were run on each original and on each fabric that had been laundered with each detergent. Each fabric was placed under an ultraviolet light. By using this type of light, the bleach is easily detected.[10]

## VI. EVALUATION

The per cent whiteness retention was calculated from the light reflectance values by using the following formula:

$$\text{Whiteness retention} = \frac{\text{Reflectance after washing}}{\text{Reflectance unwashed fabric}} \times 100$$ [11]

The use of this formula makes it possible to compare fabrics with different original reflectance readings.

After developing the data, it was necessary to determine whether there was a significant difference in the whiteness retention of the two types of fabrics and also to determine if there was a significant

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9 Richard S. Hunter, Photoelectric Tristimulus Colorimetry with Three Filters, (Washington: United States Printing Office, 1942), p. 30.

10 Eugene Allen, "Evaluation of Whitening Efficiency of Fluorescent Whitening Agents," American Dyestuff Reporter, XXXXVI, (June 17, 1957), p. 428.

11 Jay C. Harris, Detergency Evaluation and Testing, (New York: Interscience Publishers, Inc., 1954), p. 134.

difference in the effectiveness of the detergents. This was done by setting up two null hypotheses which were:

1. There was no significant difference in the whiteness retention of the all-cotton fabrics as compared to the Dacron and cotton fabrics at the end of fifty launderings.

2. There is no significant difference in the effectiveness of the light duty and the heavy duty synthetic detergents upon the whiteness retention of the all-cotton and Dacron and cotton fabrics.

Student's "t" formula was selected to test the two hypotheses at the 95 per cent confidence limit. The calculations that were used in this study were suggested by Brownlee.[12] They are:

$$t = \bar{x}_1 - \bar{x}_2 \sqrt{\frac{N_1 N_2}{N_1 + N_2}}$$

when:

$$\sigma^2 = \frac{\left[\Sigma(x_1^2) - \frac{(\Sigma(x))^2}{N_1} + \Sigma(x_2^2) - \frac{(\Sigma(x))^2}{N_2}\right]}{N_1 + N_2 - 2}$$

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12 Harris, op. cit., p. 7, citing K. A. Brownlee, Industrial Experimentation, (3rd edition; Brooklyn, New York: Chemical Publishing Company, 1949), p. 34.

# CHAPTER IV

## PRESENTATION OF DATA

### I. FABRICS USED IN THIS STUDY

The fabrics that were used in this study were part of a selection which was purchased for a larger research project that is being conducted by the North Carolina Experiment Station. The purpose of the project is to compare the serviceability of Dacron and cotton fabrics which may be used for shirts and blouses with the serviceability of similar all-cotton fabrics.[1]

Three white all-cotton fabrics were chosen which were considered most appropriate for use in shirts and blouses. Then three Dacron and cotton fabrics were selected which were similar in some respects to the all-cotton.

The specifications for the fabrics as given by the manufacturer or supplier are presented in Table I. It may be seen from this table that the all-cotton fabrics contained 100 per cent cotton while each Dacron and cotton fabric contained varying amounts of each fiber. XB-6 contained 40 per cent cotton and 60 per cent Dacron, while XB-8 contained 33.3 per cent cotton and 66.7 per cent Dacron, and the third fabric, XO-4, contained 35 per cent cotton and 65 per cent Dacron. Table I also

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[1] Pauline E. Keeney, "The Serviceability of Materials Made of Dacron and Cotton Used in Shirts and Blouses," (Project H-77, North Carolina Agricultural Experiment Station, Raleigh, 1955- ).

TABLE I

FABRIC SPECIFICATIONS GIVEN BY MANUFACTURER OR SUPPLIER[2]

| Fabric number | Fiber | Percentage composition | Cost/yard Retail | Cost/yard Wholesale | Manufacturing firm | Supplier | Miscellaneous information |
|---|---|---|---|---|---|---|---|
| All Cotton | | | | | | | |
| B-1 | Cotton | 100 | 1.29 | -- | Jackson & Jackson | Belk's Dept. Store | Batiste |
| B-2 | " | 100 | .98 | -- | Logantex, Inc. | Meyer's Dept. Store | Batiste 40" wide |
| O-3 | " | 100 | 1.19 | -- | Logantex, Inc. | Pomeroy's Dept. Store | Oxford |
| Dacron/cotton | | | | | | | |
| XB-6 | Cotton<br>Dacron | 40.0<br>60.0 | -- | 1.30 | -- | Travis Fabrics | "Cairo" |
| XB-8 | Egyptian cotton<br>Dacron | 33.3<br>66.7 | -- | 1.35 | -- | Travis Fabrics | "Pyramid" |
| XO-4 | Cotton<br>Dacron | 35.0<br>65.0 | -- | 1.25 | Deering, Milliken & Company | Manhattan Shirt Co. | Finished at Bradford Dyeing Assoc. Name: Dacford |

[2] Ibid.

shows that the price range of the cotton fabrics was from $.98 - $1.29 per yard. The price range of the Dacron and cotton blends was from $1.25 - $1.30 per yard wholesale.

A laboratory analysis was made of the fabric construction. The results of these tests may be found in Table II.

Fiber Content. Results of the tests that were performed on the fabrics showed that the all-cotton fabrics contained 100 per cent cotton as the manufacturer or supplier claimed. However, claims concerning the per cent Dacron and the per cent cotton in the three Dacron and cotton fabrics differed slightly from those given by the manufacturer. It was found that XB-6 contained 69.3 per cent Dacron and 30.7 per cent cotton, while XB-8 contained 68.7 per cent Dacron and 31.3 per cent cotton, and yet XO-4 contained 68.9 per cent Dacron and 31.3 cotton. All, however, were approximately two-thirds Dacron and one-third cotton.

Weave. Four of the fabrics selected had a plain weave. They are the all-cotton batiste fabrics and the Dacron and cotton batiste fabrics. The other two, the all-cotton Oxford cloth and the Dacron and cotton Oxford were 2 x 1 basket weaves.

Width. The all-cotton fabrics ranged in width from 38 inches to 40 inches. The Dacron and cotton fabrics were slightly wider than the all-cotton. One of the Dacron and cotton fabrics was 46 inches and the other two were 45 inches wide.

Thickness. The batiste type all-cotton fabrics were slightly thinner than the Dacron and cotton batiste types. B-1 was .004 of an inch thick, B-2 was .005 of an inch thick while XB-6 and XB-8 were .008 of an inch thick. There was little difference in the two Oxford type

TABLE II

LABORATORY ANALYSIS OF FABRIC CONSTRUCTION*

| Fiber number | Fiber content (Per cent) Dacron | Cotton | Weave | Width (inches) | Thickness (inches) | Weight (oz./sq. yd.) | Thread count warp | Filling | Yarn number Warp | Filling | Staple length (inches) Warp | Filling | Twist warp | Twist filling |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All-cotton | | | | | | | | | | | | | | |
| B-1 | — | 100 | Plain | 38 | .004 | 1.4 | 114 | 108 | 93.8 | 135.8 | 1.6 | 1.5 | 32Z | 32Z |
| B-2 | — | 100 | Plain | 40 | .005 | 1.9 | 96 | 98 | 62.6 | 80.8 | 1.2 | 1.3 | 26Z | 32Z |
| O-3 | — | 100 | 2 x 1 Basket | 38 | .023 | 4.0 | 94 | 45 | 42.2 | 13.5 | 1.3 | 1.1 | 20Z | 11Z |
| Dacron and cotton | | | | | | | | | | | | | | |
| XB-6 | 69.3 | 30.7 | Plain | 45 | .008 | 2.4 | 91 | 79 | 49.0 | 56.0 | 1.6 | 1.6 | 29Z | 28Z |
| XB-8 | 68.7 | 31.3 | Plain | 46 | .008 | 2.9 | 103 | 98 | 46.0 | 60.0 | 1.6 | 1.6 | 26Z | 33Z |
| XO-4 | 68.9 | 31.3 | 2 x 1 Basket | 45 | .021 | 4.4 | 94 | 46 | 39.9 | 12.1 | 1.5 | 1.7 | 26Z | 14Z |

*Pauline E. Keeney, "The Serviceability of Materials Made of Dacron and Cotton Used in Shirts and Blouses," Project H-77, North Carolina Agricultural Experiment Station, Raleigh, 1955- ).

fabrics. The all-cotton O-3 was .023 of an inch thick and the comparable Dacron and cotton XO-4 was .021 of an inch thick.

Weight. The all-cotton fabrics were lighter in weight than the Dacron and cotton. The all-cotton B-1 weighed 1.4 oz. per square yard, B-2 was 1.9 oz. per square yard, and O-3 was 4.0 oz. per square yard. The Dacron and cotton had the following weights: XB-6 weighed 2.4 oz. per sq. yard, XB-8 weighed 2.9 oz. per square yard and XO-4 weighed 4.4 oz. per square yard. Thus the two Oxford cloth fabrics were more similar than the batiste fabrics.

Thread Count. The all-cotton Oxford cloth and the Dacron and cotton Oxford were more similar in both warp and filling thread count than the batiste fabrics. The all-cotton batiste fabrics were of finer quality than the Dacron and cotton fabrics. The all-cotton B-1 and B-2 had warp count of 114 and 96 threads per inch respectively as compared to counts of 91 and 103 for the Dacron and cotton batiste fabrics. The filling count of XB-8 was the same as the filling count of B-2 and slightly less than that of B-1. The filling count of XB-6 was much lower than that of any of the other batiste type fabrics.

Yarn Number. There was a great difference in the yarn number of the three all-cotton fabrics in both warp and filling threads. All-cotton B-1 had a warp yarn number of 93.8 and a filling yarn number of 135.8, while B-2 had a warp yarn number of 62.6 and a filling yarn number of 80.8, the larger of the three, O-3, had a warp yarn number of 42.2 and a filling yarn number of 13.5.

The Dacron and cotton fabric XB-6 had a warp yarn number of 49.0 and a filling yarn number of 56.0. Dacron and cotton XB-8 had a

warp yarn number of 46.0 and a filling number of 60.0 while XO-4 had a warp yarn number of 39.9 and a filling number of 12.1.

The two Oxford cloth fabrics were again more alike than the batiste fabrics.

Staple Length. There was more variation in the staple length of the all-cotton fabrics than the Dacron and cotton fabrics. The warp length of the all-cotton ranged from 1.2 inches to 1.6 inches while the length of filling staple ranged from 1.1 inches to 1.5 inches.

The Dacron and cotton warp staple lengths were XB-6 with 1.6 inches, XB-8 with 1.6 inches, and XO-4 with 1.5 inches. The filling staple length for the three Dacron and cotton fabrics were XB-6 with 1.6 inches, XB-8 with 1.6 inches, and XO-4 with 1.7 inches. As can readily be seen, there was little difference in the staple length of the Dacron and cotton fabrics since long staple cottons were used. B-1 was the only all-cotton fabric in which long staple cotton was used.

Twist Count. All six of the fabrics had a Z-twist for both warp and filling threads.

The all-cotton B-1 and B-2 had a warp twist count of 32 and 26, while the filling count of both was 32. The all-cotton O-3 had a warp twist count of 20 and a filling twist count of 11.

The Dacron and cotton XB-6, and XB-8 had a warp twist count of 29 and 26 and a filling twist count of 28 and 33. Dacron and cotton XO-4 had a warp twist count of 26 and a filling twist count of 14.

## II. COMPARISON OF PERCENTAGE LIGHT REFLECTANCE BEFORE AND AFTER LAUNDERING

Reflectance Before Laundering. The light reflectance of the six fabrics was tested by the Hunter Reflectometer before the fabrics were laundered. The percentage of light reflectance of the six is reported in Table III.

Each of the three all-cotton fabrics had a higher light reflectance value before laundering than the Dacron and cotton fabrics had at the same stage. The average of the original light reflectance for the three all-cotton fabrics was 84.7 per cent as compared to an average of 77.1 per cent for the three Dacron and cotton fabrics.

Conditions of Laundering Solution. A series of tests was performed on the hardness of Greensboro city water which was used for this study. A series of tests was run on different days. It was found that the water has an average of 5 grains of hardness per United States gallon.

The pH of the laundering solution of each of the four synthetic detergents was tested at intervals during the study. Tests were made on different days and an average was taken for each detergent. The following averages resulted from the tests:

| Detergents | pH |
|---|---|
| A | 6.9 |
| B | 9.1 |
| C | 9.3 |
| D | 9.2 |

In order to determine whether the detergents contained optical bleaches, the original fabrics were placed under an ultraviolet light. None of the original fabrics contained an optical bleach. When the fabrics that had been laundered were placed under the light, it was

TABLE III

PER CENT LIGHT REFLECTANCY BEFORE AND AFTER LAUNDERING

| Fabric number | All-Cotton Fabrics | | | | | | | | Fabric number | Dacron and Cotton Fabrics | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Original | Times Laundered | | | | | | | | Original | Times Laundered | | | | | | |
| | | 1 | 2 | 5 | 10 | 20 | 35 | 50 | | | 1 | 2 | 5 | 10 | 20 | 35 | 50 |
| **DETERGENT A (Alkyl Aryl Sulfonate ) Light duty anionic** | | | | | | | | | | | | | | | | | |
| B-1 | 83.4 | 80.0 | 80.9 | 81.0 | 80.8 | 79.7 | 79.3 | 79.8 | XO-4 | 76.8 | 79.3 | 78.2 | 78.1 | 78.3 | 78.3 | 80.6 | 80.7 |
| B-2 | 85.5 | 80.9 | 79.0 | 81.9 | 81.5 | 80.4 | 80.6 | 80.8 | XB-6 | 76.1 | 75.2 | 73.5 | 73.6 | 73.9 | 74.6 | 72.9 | 73.6 |
| O-3 | 85.2 | 85.7 | 85.2 | 84.4 | 86.5 | 85.4 | 85.9 | 86.5 | XB-8 | 78.5 | 78.1 | 76.4 | 77.0 | 77.7 | 77.2 | 75.6 | 77.3 |
| Av. | 84.7 | 82.2 | 81.7 | 82.4 | 82.9 | 81.8 | 81.9 | 82.3 | | 77.1 | 77.5 | 76.0 | 76.2 | 76.6 | 76.7 | 76.4 | 77.2 |
| **DETERGENT B (Alkyl Aryl Sulfonate) Heavy duty anionic** | | | | | | | | | | | | | | | | | |
| B-1 | 83.4 | 79.3 | 79.7 | 80.7 | 80.5 | 79.7 | 79.9 | 80.1 | XO-4 | 76.8 | 78.6 | 79.4 | 80.2 | 80.1 | 79.3 | 82.9 | 82.3 |
| B-2 | 85.5 | 82.0 | 80.0 | 80.5 | 80.7 | 81.4 | 82.1 | 81.6 | XB-6 | 76.1 | 77.6 | 74.1 | 75.1 | 75.5 | 75.4 | 75.9 | 76.5 |
| O-3 | 85.2 | 85.7 | 86.3 | 85.6 | 87.6 | 85.1 | 87.2 | 88.1 | XB-8 | 78.5 | 78.3 | 76.2 | 78.6 | 78.4 | 77.9 | 78.0 | 77.8 |
| Av. | 84.7 | 82.3 | 82.0 | 82.3 | 82.9 | 82.1 | 83.1 | 83.3 | | 77.1 | 78.2 | 76.6 | 77.9 | 78.0 | 77.5 | 78.9 | 78.9 |
| **DETERGENT C (Alkyl Sulfate) Light duty anionic** | | | | | | | | | | | | | | | | | |
| B-1 | 83.4 | 79.8 | 77.8 | 81.0 | 80.2 | 80.4 | 81.1 | 80.3 | XO-4 | 76.8 | 78.1 | 78.8 | 77.4 | 78.6 | 77.9 | 81.1 | 82.5 |
| B-2 | 85.5 | 79.3 | 79.5 | 80.1 | 80.0 | 81.5 | 81.6 | 82.4 | XB-6 | 76.1 | 73.3 | 73.6 | 73.3 | 73.8 | 75.2 | 75.2 | 75.6 |
| O-3 | 85.2 | 84.5 | 84.5 | 83.2 | 82.2 | 83.1 | 83.9 | 84.9 | XB-8 | 78.5 | 78.6 | 77.7 | 77.8 | 78.7 | 80.2 | 79.1 | 79.4 |
| Av. | 84.7 | 81.2 | 80.6 | 81.4 | 80.8 | 81.7 | 82.2 | 82.5 | | 77.1 | 76.7 | 76.7 | 76.2 | 77.0 | 77.8 | 78.5 | 79.2 |
| **DETERGENT D (Alkyl Aryl Sulfonate and Alkyl Sulfate) Heavy duty anionic** | | | | | | | | | | | | | | | | | |
| B-1 | 83.4 | 79.3 | 79.7 | 80.1 | 83.4 | 81.8 | 82.0 | 81.6 | XO-4 | 76.8 | 79.6 | 80.5 | 78.8 | 79.6 | 79.6 | 82.6 | 80.4 |
| B-2 | 85.5 | 81.4 | 79.1 | 80.5 | 81.4 | 82.2 | 82.0 | 82.1 | XB-6 | 76.1 | 74.3 | 74.0 | 74.1 | 74.3 | 76.1 | 76.0 | 76.4 |
| O-3 | 85.2 | 86.0 | 85.1 | 83.8 | 82.9 | 82.8 | 87.3 | 86.0 | XB-8 | 78.5 | 79.5 | 78.6 | 78.0 | 77.9 | 79.9 | 79.4 | 79.3 |
| Av. | 84.7 | 82.2 | 81.3 | 81.5 | 82.6 | 82.3 | 83.8 | 83.2 | | 77.1 | 77.8 | 77.7 | 76.9 | 77.3 | 78.5 | 79.3 | 78.7 |
| Av. of all detergents | 84.7 | 81.9 | 81.4 | 81.9 | 82.3 | 81.0 | 82.8 | 82.8 | | 77.1 | 77.6 | 76.8 | 76.8 | 77.2 | 77.6 | 78.3 | 78.5 |

evident that those laundered with detergents B, C, and D contained optical bleaches. The fabric laundered with Detergent A was the only one showing no evidence of optical bleach.

Reflectance After Laundering. The average per cent light reflectance before and after laundering is shown on Figure 1.

The reflectance values of the fabrics laundered with the four detergents were also averaged to show any differences in the behavior of the two types of fabrics.

Changes in the reflectance of each fabric group were small with some variation between the readings that were taken at the different testing periods. The reflectance values of the all-cotton fabrics decreased, indicating a darkening or dulling of the original whiteness. The Dacron and cotton showed a slight increase in reflectance values when laundered progressively, indicating a brightening of the original white.

## III. COMPARISON OF WHITENESS RETENTION DURING LAUNDERING

Since the reflectance changes were so small and variable, the per cent whiteness retention was determined and will be used in the presentation of further data. The per cent whiteness retention after each laundering is shown in Table IV.

Comparison of Dacron and Cotton Blends With All-Cotton Fabrics. As shown in Figure 2, the average per cent whiteness retention of the Dacron and cotton fabrics is higher after each laundering than the all-cotton fabrics. With the exception of the second and fifth laundering periods the Dacron and cotton fabrics increased in whiteness while the all-cotton fabrics showed a general decrease in whiteness.

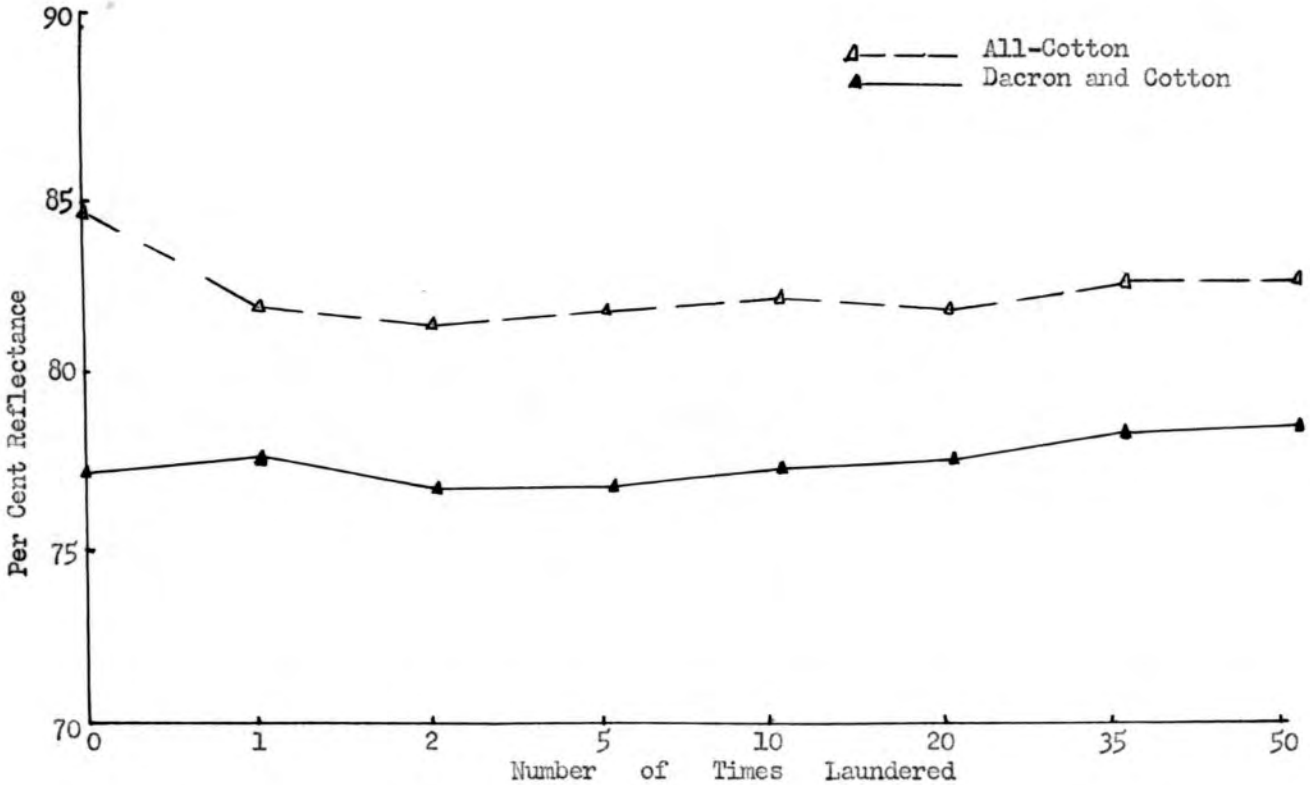


FIGURE 1

AVERAGE PER CENT LIGHT REFLECTANCE BEFORE AND AFTER LAUNDERING

TABLE IV

PER CENT WHITENESS RETENTION BEFORE AND AFTER LAUNDERING

| Fabric number | All-Cotton Fabrics: Times Laundered 1 | 2 | 5 | 10 | 20 | 35 | 50 | Fabric number | Dacron and Cotton Fabrics: Times Laundered 1 | 2 | 5 | 10 | 20 | 35 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DETERGENT A (Alkyl Aryl Sulfonate) | | | | | | | | | | | | | | | |
| B-1 | 95.9 | 97.1 | 97.1 | 96.8 | 95.5 | 95.2 | 95.6 | XO-4 | 103.2 | 101.8 | 101.7 | 101.9 | 101.9 | 104.1 | 104.2 |
| B-2 | 94.6 | 92.4 | 95.8 | 95.3 | 94.0 | 94.3 | 94.5 | XB-6 | 98.8 | 96.6 | 96.7 | 97.1 | 98.0 | 95.7 | 96.7 |
| 0-3 | 100.1 | 100.0 | 99.1 | 101.5 | 100.1 | 100.8 | 101.5 | XB-8 | 99.5 | 97.3 | 98.1 | 98.9 | 98.3 | 96.2 | 98.4 |
| Av. | 96.9 | 96.5 | 97.3 | 97.9 | 96.5 | 96.8 | 97.2 | Av. | 100.5 | 98.6 | 98.8 | 99.3 | 99.4 | 98.7 | 99.8 |
| DETERGENT B (Alkyl Aryl Sulfonate) | | | | | | | | | | | | | | | |
| B-1 | 93.9 | 94.3 | 96.8 | 96.5 | 95.5 | 95.8 | 96.2 | XO-4 | 102.3 | 103.3 | 104.4 | 104.3 | 103.2 | 107.9 | 107.1 |
| B-2 | 95.9 | 93.5 | 94.1 | 94.4 | 95.2 | 96.0 | 95.4 | XB-6 | 101.9 | 97.3 | 98.7 | 99.2 | 99.1 | 99.7 | 100.5 |
| 0-3 | 100.6 | 101.3 | 100.5 | 102.8 | 99.9 | 102.3 | 103.4 | XB-8 | 99.7 | 97.1 | 100.1 | 99.9 | 99.2 | 99.4 | 99.1 |
| Av. | 96.8 | 96.4 | 97.1 | 97.9 | 96.9 | 98.0 | 98.3 | Av. | 101.3 | 99.2 | 101.1 | 101.1 | 100.5 | 102.3 | 102.2 |
| DETERGENT C (Alkyl Sulfate) | | | | | | | | | | | | | | | |
| B-1 | 95.7 | 93.2 | 97.1 | 96.4 | 96.5 | 97.2 | 96.3 | XO-4 | 101.7 | 102.6 | 100.7 | 102.3 | 101.4 | 105.6 | 107.4 |
| B-2 | 92.2 | 93.0 | 93.6 | 93.5 | 95.3 | 95.4 | 96.3 | XB-6 | 96.3 | 96.7 | 96.3 | 96.8 | 98.8 | 98.8 | 99.3 |
| 0-3 | 99.2 | 99.2 | 97.6 | 96.5 | 97.5 | 98.4 | 99.6 | XB-8 | 99.3 | 98.9 | 99.1 | 99.4 | 102.2 | 100.7 | 101.0 |
| Av. | 95.7 | 95.1 | 96.1 | 95.5 | 96.4 | 97.0 | 97.4 | Av. | 99.1 | 99.4 | 98.7 | 99.5 | 101.8 | 101.7 | 102.6 |
| DETERGENT D (Alkyl Aryl Sulfonate and Alkyl Sulfate) | | | | | | | | | | | | | | | |
| B-1 | 93.9 | 94.3 | 96.2 | 100.0 | 98.0 | 98.3 | 97.8 | XO-4 | 103.6 | 104.8 | 102.6 | 103.6 | 103.6 | 101.5 | 104.7 |
| B-2 | 95.2 | 92.5 | 94.2 | 95.2 | 96.1 | 95.9 | 96.0 | XB-6 | 97.6 | 97.2 | 97.3 | 97.6 | 100.0 | 99.9 | 100.4 |
| 0-3 | 100.9 | 99.9 | 98.3 | 97.3 | 97.2 | 102.4 | 100.9 | XB-8 | 101.3 | 99.3 | 99.4 | 99.2 | 101.7 | 101.2 | 101.1 |
| Av. | 96.7 | 95.6 | 96.2 | 97.5 | 97.1 | 98.9 | 98.2 | Av. | 100.8 | 100.4 | 99.8 | 100.1 | 101.8 | 102.9 | 102.1 |
| Av. of all detergents | 96.5 | 95.9 | 96.7 | 97.2 | 96.7 | 97.7 | 97.8 | | 100.4 | 99.4 | 99.6 | 100.0 | 100.9 | 101.4 | 101.7 |

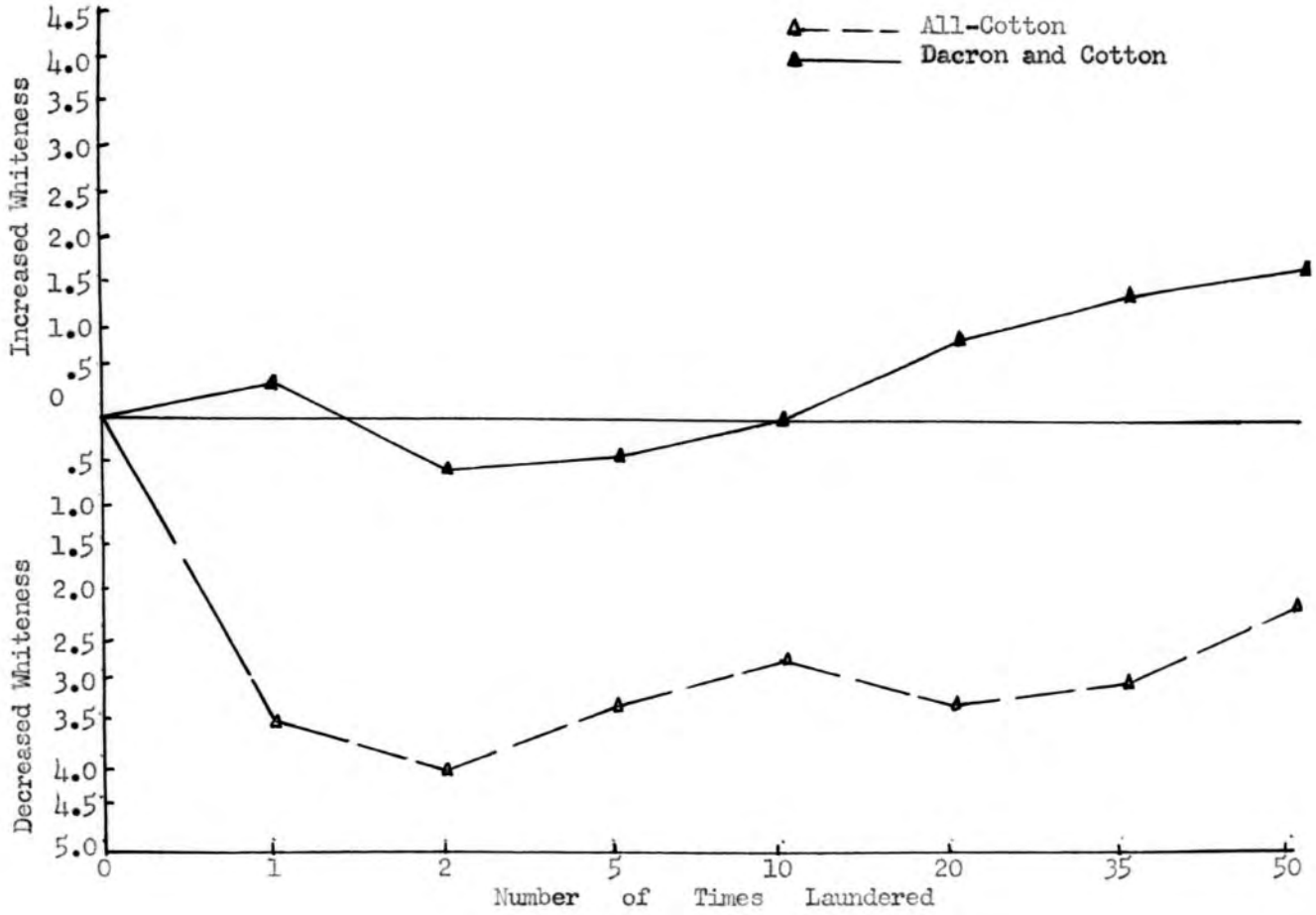


FIGURE 2

AVERAGE PER CENT DEVIATION OF WHITENESS RETENTION FROM ORIGINAL

After the first laundering the Dacron and cotton fabric increased in whiteness retention 0.4 per cent while the whiteness retention of the all-cotton fabrics decreased 3.5 per cent. The all-cotton fabrics continued to decrease after the second laundering with a 4.1 per cent difference from the original reading as compared to the 0.6 per cent decrease in whiteness of the Dacron and cotton fabrics at this point. This point represents the lowest per cent whiteness recorded for both groups of fabrics.

After the second laundering the per cent whiteness retention of the Dacron and cotton increased progressively at each testing period, reaching 101.7 per cent whiteness after the fiftieth laundering. The increase in whiteness retention of the all-cotton fabrics was not as regular as that of the Dacron and cotton fabrics and did not exceed the original whiteness at any of the testing periods. After fifty launderings the average per cent whiteness retention for the all-cotton fabrics was 97.8.

Differences in the Whiteness of the Six Fabrics Used in the Study. There were slight differences in the whiteness retention of the six fabrics when laundered with the four detergents. These changes, presented in Table V, are shown graphically in Figure 3.

During the entire study, fabrics B-1, B-2, and XB-6 were not as white as their originals. After the second laundering, fabric B-2 reached the lowest per cent whiteness retention in the entire study with an average whiteness retention of 92.9 per cent. Fabric O-3 showed a reading slightly above its original reflectance after the first and second launderings, a reflectance below its original after the fifth, tenth, and

TABLE V

PER CENT WHITENESS RETENTION IN EACH FABRIC

| Fabric | Fabric number | Times Laundered | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 5 | 10 | 20 | 35 | 50 |
| All-Cotton | B- 1 | 94.9 | 94.7 | 96.8 | 97.4 | 96.4 | 96.6 | 96.5 |
| | B- 2 | 94.5 | 92.9 | 94.4 | 94.6 | 95.2 | 95.4 | 95.6 |
| | O- 3 | 100.2 | 100.1 | 98.9 | 99.5 | 98.7 | 100.9 | 101.3 |
| Dacron and Cotton | XO-4 | 102.7 | 103.1 | 102.4 | 103.0 | 102.5 | 106.3 | 105.9 |
| | XB-6 | 98.7 | 96.9 | 97.3 | 97.8 | 98.9 | 98.5 | 98.2 |
| | XB-8 | 99.9 | 98.2 | 99.2 | 99.4 | 100.4 | 99.4 | 98.9 |

twentieth launderings and again an increase above original after launderings thirty-five and fifty. Fabric XO-4 had whiteness retention values above its original during the entire laundering period. After the thirty-fifth laundering, XO-4 reached the highest whiteness retention value of the entire study with an average of 106.2 per cent. Fabric XB-8 showed readings below its original after each laundering except the twentieth, when it was slightly higher than its original reading.

Mathematical Comparison. The significance of the data was computed in the following manner. The data that were computed are presented in Table VI.

Null hypothesis - There is no significant difference in the whiteness retention of the all-cotton fabrics as compared to the Dacron and cotton fabrics at the 95 per cent level of significance after fifty launderings.

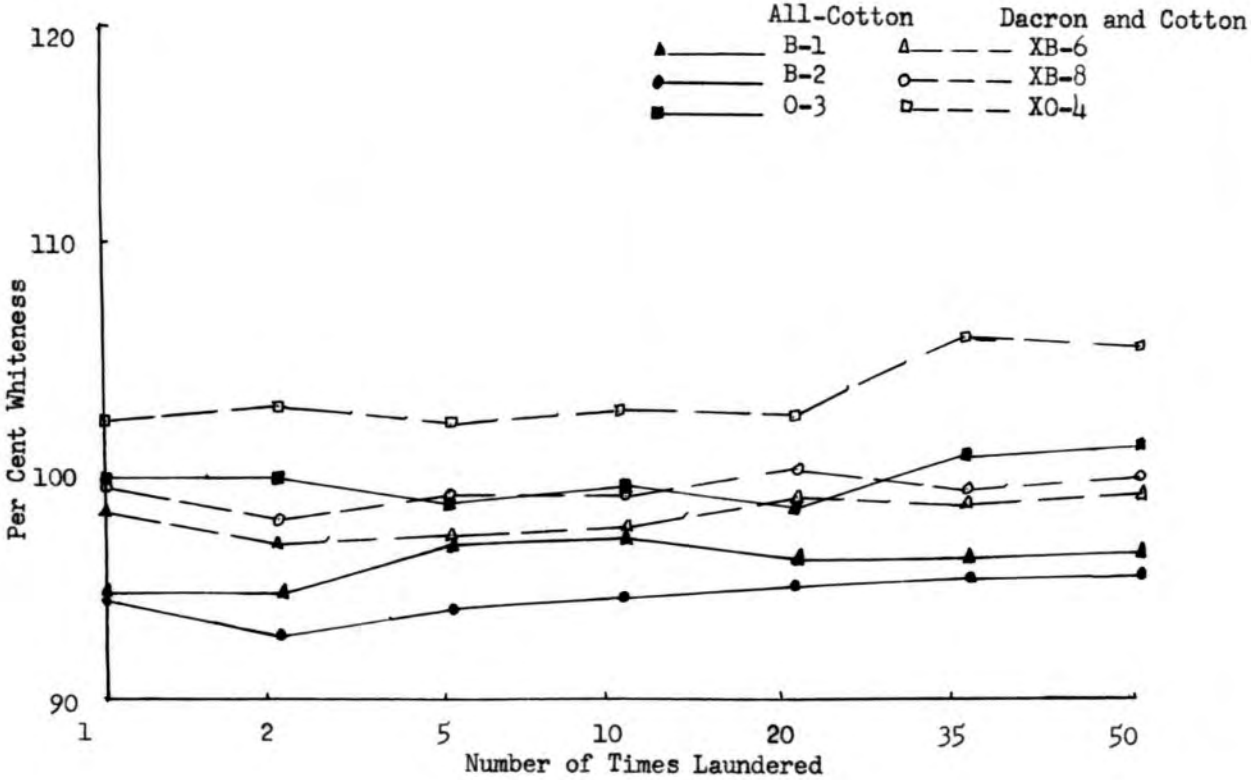


FIGURE 3

AVERAGE PER CENT WHITENESS RETENTION IN EACH FABRIC

TABLE VI

COMPARISON OF SAMPLE MEANS FOR THE FABRICS

| | All-Cotton | | Dacron and Cotton | |
|---|---|---|---|---|
| | $\bar{x}$ | $x^2$ | $\bar{x}$ | $x^2$ |
| | 95.6 | 9139.3 | 104.2 | 10857.6 |
| | 94.5 | 8930.2 | 96.7 | 9350.9 |
| | 101.5 | 10302.2 | 98.4 | 9682.6 |
| | 96.2 | 9254.4 | 107.1 | 11470.4 |
| | 95.4 | 9101.1 | 100.5 | 10025.0 |
| | 103.4 | 10691.6 | 99.1 | 9820.8 |
| | 96.3 | 9273.7 | 107.4 | 11534.7 |
| | 96.3 | 9273.7 | 99.3 | 9860.5 |
| | 99.6 | 9920.1 | 101.0 | 10201.0 |
| | 97.8 | 9564.8 | 104.7 | 10962.0 |
| | 96.0 | 9216.0 | 100.4 | 10080.1 |
| | 100.0 | 10180.8 | 101.1 | 10221.2 |
| Totals | 1173.5 | 114847.9 | 1219.9 | 124066.8 |

$Ex^2 = 1377102.2$ $\qquad$ $Ex^2 = 1488156.0$

$$\sigma^2 = \frac{\Sigma(x)^2 - \frac{(\Sigma(x_1))^2}{N_1} + \Sigma(x_2^2) - \frac{(\Sigma(x_2))^2}{N_2}}{N_1 + N_2 - 2}$$

$$\sigma^2 = \frac{114847.9 - \frac{1377102.2}{12} + 124066.8 - \frac{1488156.0}{12}}{12 + 12 - 2}$$

$\sigma^2 = 6.5$

$\sigma = 2.5$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sigma} \sqrt{\frac{N_1 \times N_2}{N_1 + N_2}}$$

$$t = \frac{97.8 - 101.7}{2.5} \sqrt{\frac{12 \times 12}{12 + 12}}$$

$t = 3.8$

"t" at 95 per cent significance level = 2.074

After the above computations were made, it was concluded that "t" is equal to 3.8. According to Student's "t" table, the 95 per cent confidence limit is 2.074. Since our "t" is larger, there was a significant difference in the whiteness retention of the Dacron and cotton fabrics and the all-cotton fabrics after fifty launderings.

## IV. THE EFFECTIVENESS OF THE DETERGENTS USED

In spite of the chemical differences in the synthetic detergents and claims for superior performance, only slight differences were seen between the four detergents used to launder the all-cotton and the Dacron and cotton fabrics. The changes are shown in Table VII.

TABLE VII

PER CENT DEVIATION OF WHITENESS RETENTION FROM THE ORIGINAL

| Fabric | Detergent | Times Laundered | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 5 | 10 | 20 | 35 | 50 |
| All-Cotton | A | -3.1 | -3.5 | -2.7 | -2.1 | -3.5 | -3.2 | -2.8 |
| | B | -3.2 | -3.6 | -2.9 | -2.1 | -3.1 | -2.0 | -2.3 |
| | C | -4.3 | -4.9 | -3.9 | -4.5 | -3.6 | -6.3 | -2.6 |
| | D | -3.3 | -4.4 | -3.8 | -2.5 | -2.9 | -1.1 | -1.8 |
| | Average | -3.5 | -4.1 | -3.3 | -2.8 | -3.3 | -3.2 | -2.4 |
| Dacron and Cotton | A | +0.5 | -1.4 | -1.2 | -0.7 | -0.6 | -1.3 | -0.2 |
| | B | +1.3 | -0.8 | +1.1 | +1.1 | +0.5 | +2.3 | +2.2 |
| | C | -0.9 | -0.6 | -1.3 | -0.5 | +1.8 | +1.7 | +2.6 |
| | D | +0.8 | +0.4 | -0.2 | +0.1 | +1.8 | +2.9 | +2.1 |
| | Average | +0.4 | -0.6 | -0.4 | 0.0 | +0.9 | +1.4 | +1.7 |

Effectiveness on the Three All-Cotton Fabrics. There was a decrease in whiteness from the original fabrics laundered with each of the four detergents. In the all-cotton fabrics there was approximately the same

decrease in whiteness with detergents A, B, and D, and a slightly greater decrease with detergent C.

The fabrics laundered with all four of the detergents continued to decrease in whiteness retention value after the second reading. At this point those laundered with detergent C reached a point of 4.9 per cent below the original which was the greatest decrease in whiteness produced by any of the detergents during the entire study.

After the fifth laundering the fabrics laundered with all the detergents showed a slight increase over the second laundering which continued through the tenth for those laundered with detergents A, B, and D. In these same fabrics there was some loss of whiteness noted after the twentieth laundering while those laundered with detergent C showed a slight gain in whiteness retention over that shown in the tenth laundering.

Fabrics laundered with detergents A, B, and D continued to increase in whiteness through the thirty-fifth laundering while those laundered with detergent C showed a marked decrease.

After the thirty-fifth laundering the fabrics laundered with detergent D showed the highest whiteness value of any of the fabrics with an average of 1.1 per cent below its original value. The fabrics laundered with detergents A and C showed an increase after the fiftieth laundering, while those laundered with B and D showed a slight decrease in whiteness retention.

Even though the whiteness retention value of the fabrics laundered with all four detergents was higher after the fiftieth laundering

than after the first, none returned to their original whiteness value. After the fiftieth laundering those laundered with detergent D were nearer to their original value with an average of 1.8 per cent less than the original.

Effectiveness on the Three Dacron and Cotton Fabrics. As shown in Figure 2, page 29, the four detergents were apparently more effective in keeping the Dacron and cotton fabric white than in keeping the all-cotton fabrics white. After the first laundering those fabrics that were laundered with detergents A, B, and D showed a slight increase in whiteness while those laundered with detergent C showed a slight decrease in whiteness.

Fabrics laundered with detergents A, B, and C showed a reading below the original after the second laundering while detergent D maintained a slight increase in whiteness. After the fifth laundering those laundered with detergent B were the only fabrics to show a whiteness retention value above the original. After the tenth laundering those fabrics laundered with detergents B and D showed an increase over the original whiteness while those fabrics laundered with the other two detergents were slightly below their original value. Those laundered with detergent A continued to show a reading below the original value through the twentieth, thirty-fifth, and the fiftieth launderings, while those laundered with detergents B, C, and D showed readings slightly above their original through the same three laundering periods.

Those fabrics laundered with detergent A had an average of 1.4 per cent below the original reading after the second laundering. This was the lowest point reached with any of the detergents used. The highest

point was reached after the thirty-fifth laundering by the fabrics laundered with detergent D with an average of 2.9 per cent above the original reading.

Mathematical Comparison. The significance of the data was computed in the following manner. The data that were computed are presented in Table VIII.

> Null hypothesis - There is no significant difference in the effectiveness of the built and the unbuilt detergents on the whiteness retention of all-cotton and Dacron and cotton fabrics.

TABLE VIII

COMPARISON OF SAMPLE MEANS FOR THE SYNTHETIC DETERGENTS

| Fabrics | Light Duty Detergents | | Heavy Duty Detergents | |
|---|---|---|---|---|
| | $\bar{x}$ | $\bar{x}^2$ | $\bar{x}$ | $\bar{x}^2$ |
| All-Cotton | 97.3 | 9467.3 | 98.3 | 9662.9 |
| Dacron and Cotton | 101.3 | 10241.4 | 102.2 | 10444.8 |
| Total | 198.5 | 19708.7 | 200.5 | 20107.7 |
| $\bar{x}^2$ | 39402.2 | | 40200.2 | |

$$\sigma^2 = \frac{\Sigma(x_1^2) - \frac{(\Sigma(x_1))^2}{N_1} + \Sigma(x_2^2) - \frac{(\Sigma(x_2))^2}{N_2}}{N_1 + N_2 - 2}$$

$$\sigma^2 = \frac{19136.2 - \frac{38259.4}{2} + 20484.2 - \frac{41371.6}{2}}{2 + 2 - 2}$$

$\sigma^2 = .4$

$\sigma = .2$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sigma} \sqrt{\frac{N_1 \times N_2}{N_1 + N_2}}$$

$$t = 97.4 - 101.7 \sqrt{\frac{2 \times 2}{2+2}}$$

$t = 2.1$

"t" at 95 per cent significance level = 4.303

From the above computations it was found that "t" is equal to 2.1. According to Student's "t" table, the 95 per cent confidence limit is 4.303. As a result of these calculations it can be concluded that there is no significant difference in the effect that the built and the unbuilt synthetic detergents have on the whiteness retention of all-cotton and Dacron and cotton fabrics after fifty launderings.

# CHAPTER V

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER STUDY

### I. SUMMARY AND CONCLUSIONS

Dacron and cotton blended fabrics are among the best selling fabrics on the market today. Manufacturers have made claims that the blend possesses the same properties of all-cotton fabrics with some added features. However, some consumers have been critical of the Dacron and cotton blends because they became discolored after several launderings. This was especially evident in the white fabrics which became dingy after a series of launderings and appeared to be impossible to bleach.

This study has been made to investigate the whiteness retention properties of Dacron and cotton fabrics as compared with the whiteness retention of all-cotton fabrics when laundered with four different synthetic detergents. The study is a part of a larger study that is being conducted by North Carolina State College Experiment Station.

Six fabrics were selected. Two were all-cotton batiste, two Dacron and cotton batiste, one all-cotton Oxford cloth, and one Dacron and cotton Oxford cloth. The Dacron and cotton fabrics contained approximately 65 per cent Dacron and 35 per cent cotton.

Four swatches of each of the six fabrics were prepared for laundering with the four synthetic detergents, two of which were alkyl sulfates, one alkyl aryl sulfonate, and the other was a combination of

both. The swatches were laundered thirty minutes in 500 milliliters of water and 0.5 gram of detergent. They were rinsed under running water and allowed to drip dry.

It was found that the all-cotton fabrics had a lower per cent whiteness retention than the Dacron and cotton fabrics during the entire study. After fifty launderings the Dacron and cotton fabrics showed an increase in whiteness over their original whiteness, while the all-cotton showed a decrease from their original value. When the data were compared statistically, it was found that there was a significant difference in the per cent whiteness retention of the Dacron and cotton fabrics when compared with the per cent whiteness retention of the all-cotton fabrics.

Statistical comparison indicates that there was no significant difference in the effectiveness of the light duty and the heavy duty synthetic detergents in the whiteness retention of the all-cotton and the Dacron and cotton fabrics.

## II. RECOMMENDATIONS FOR FURTHER STUDY

1. Duplicate this study using fabrics made of other synthetics which are reputed to lose their whiteness during laundering.
2. Conduct a study using a larger variety of synthetic detergents with the aim of determining which detergent is most effective in preserving the whiteness of certain fabrics.
3. Study the changes in whiteness of certain fabrics due to redeposition of soil.
4. Study the effect of detergents on certain physical properties of fabrics that would decrease their performance.

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